VOLUME 15

US009816772B2

(12) **United States Patent**
Graves

(10) **Patent No.: US 9,816,772 B2**
(45) **Date of Patent: Nov. 14, 2017**

(54) **FLEX-FIRE TECHNOLOGY**

(71) Applicant: **Thomas Allen Graves**, Buda, TX (US)

(72) Inventor: **Thomas Allen Graves**, Buda, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/421,730**

(22) Filed: **Feb. 1, 2017**

(65) **Prior Publication Data**

US 2017/0138688 A1 May 18, 2017

Related U.S. Application Data

(62) Division of application No. 14/850,380, filed on Sep. 10, 2015, now Pat. No. 9,568,264.

(60) Provisional application No. 62/049,323, filed on Sep. 11, 2014.

(51) **Int. Cl.**

F41A 19/10	(2006.01)
F41A 17/46	(2006.01)
F41A 3/68	(2006.01)

(52) **U.S. Cl.**

CPC ***F41A 19/10*** (2013.01); ***F41A 3/68*** (2013.01); ***F41A 17/46*** (2013.01)

(58) **Field of Classification Search**

CPC F41A 19/10
USPC 42/70.06
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

571,260	A	11/1896	Borchardt
580,925	A	4/1897	Browning
3,657,959	A	4/1972	Kart
4,127,056	A	11/1978	Kart
4,253,377	A	3/1981	Arnett
4,455,777	A	6/1984	Callies
4,459,774	A	7/1984	Ferretti
4,539,889	A	9/1985	Glock
4,735,009	A	4/1988	Jett, Jr.
4,955,157	A	9/1990	Brighton et al.
5,036,612	A	8/1991	Jennings
7,398,723	B1	7/2008	Blakley
8,448,366	B2	5/2013	Faifer
8,701,326	B2	4/2014	Zonshine
9,021,732	B2	5/2015	Johnson
2011/0289813	A1	12/2011	Serandour
2014/0366418	A1	12/2014	Stakes
2015/0184967	A1	7/2015	Whittington

FOREIGN PATENT DOCUMENTS

GB	18774	0/1893

OTHER PUBLICATIONS

http://tacconusa.com/ Tac Con 3MR Trigger System.

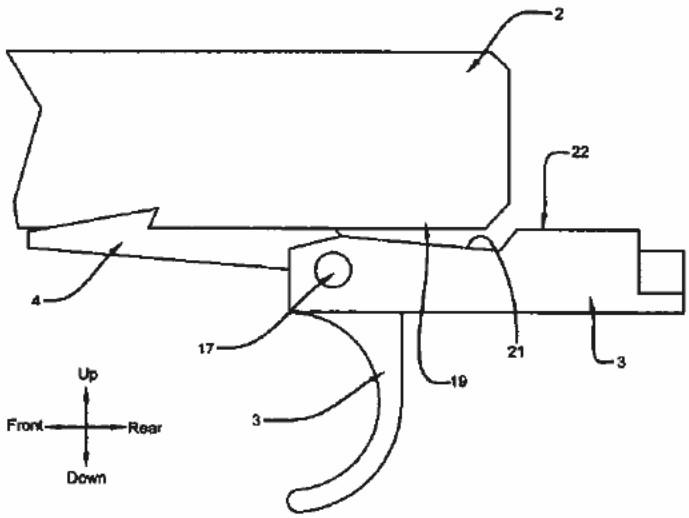
Primary Examiner — Reginald Tillman, Jr.

(74) *Attorney, Agent, or Firm* — Timothy D. Bennett; Emerson Thomson Bennett

(57) **ABSTRACT**

A handheld finger activated semi-automatic arm may include a barrel, a trigger, a moveable gun bolt and a trigger reset mechanism. The trigger reset mechanism may use rigid mechanical contact between the trigger and the gun bolt during an earliest portion of the operating cycle. The trigger may be blocked from depression by the gun bolt up to 99% of the operating cycle.

5 Claims, 3 Drawing Sheets



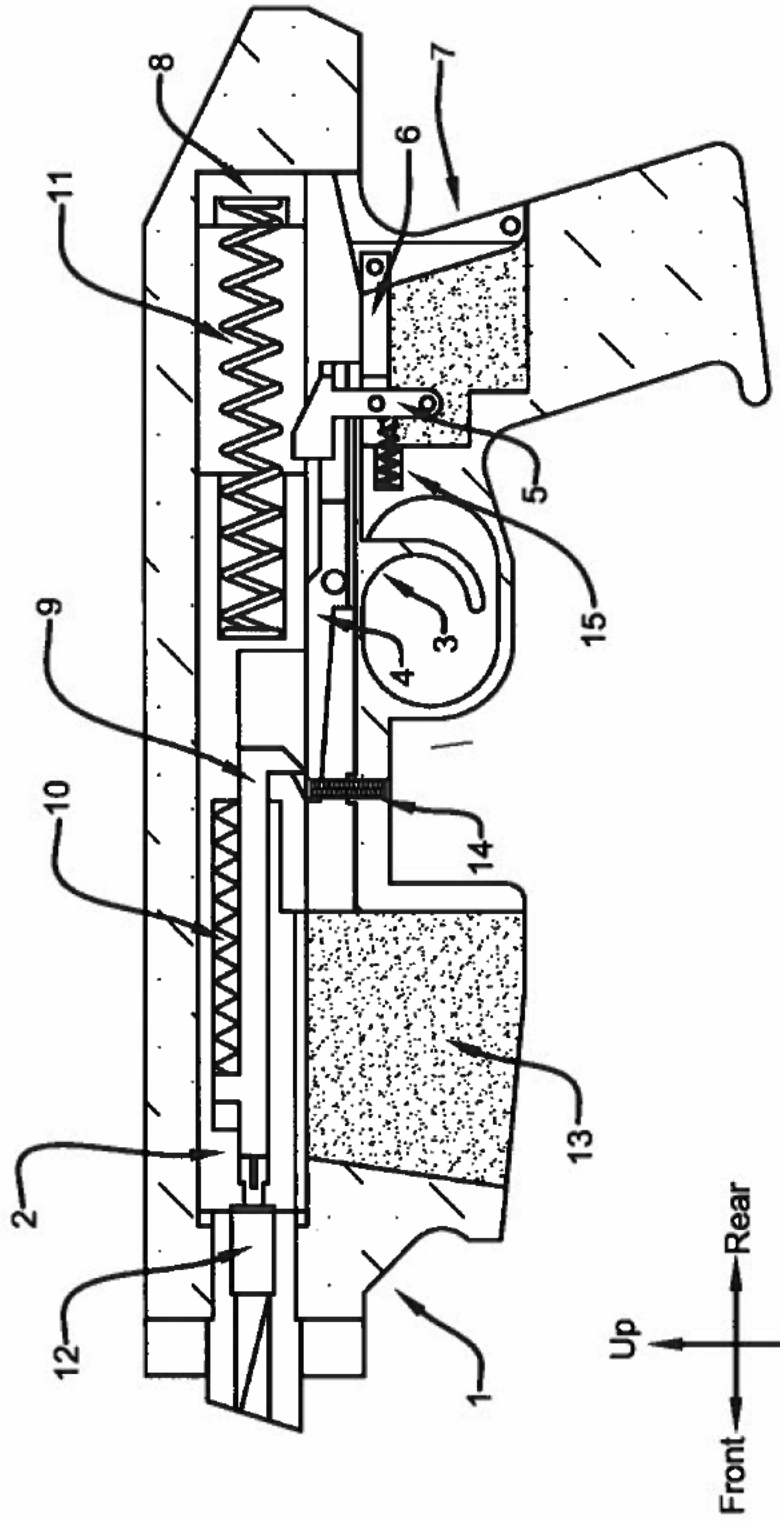


FIG.1

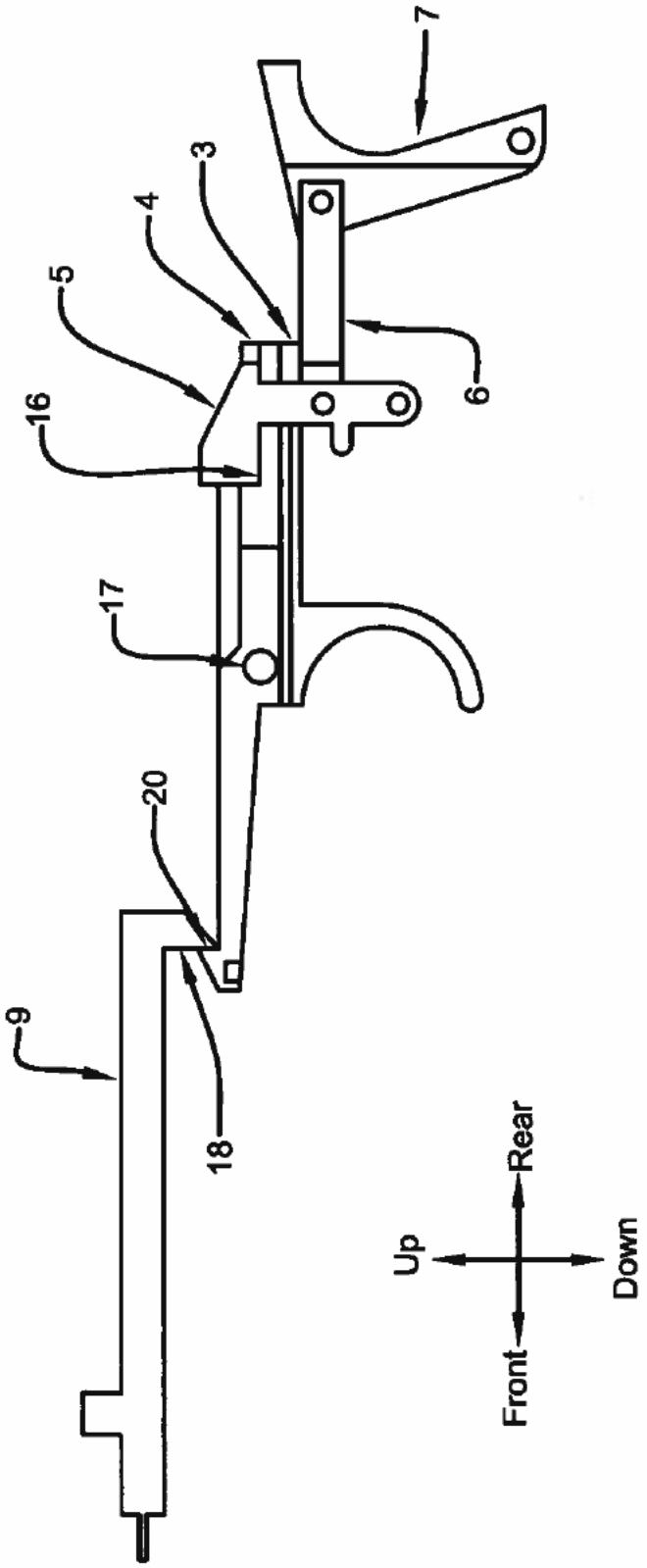


FIG. 2

Attachment G (4 of 8)

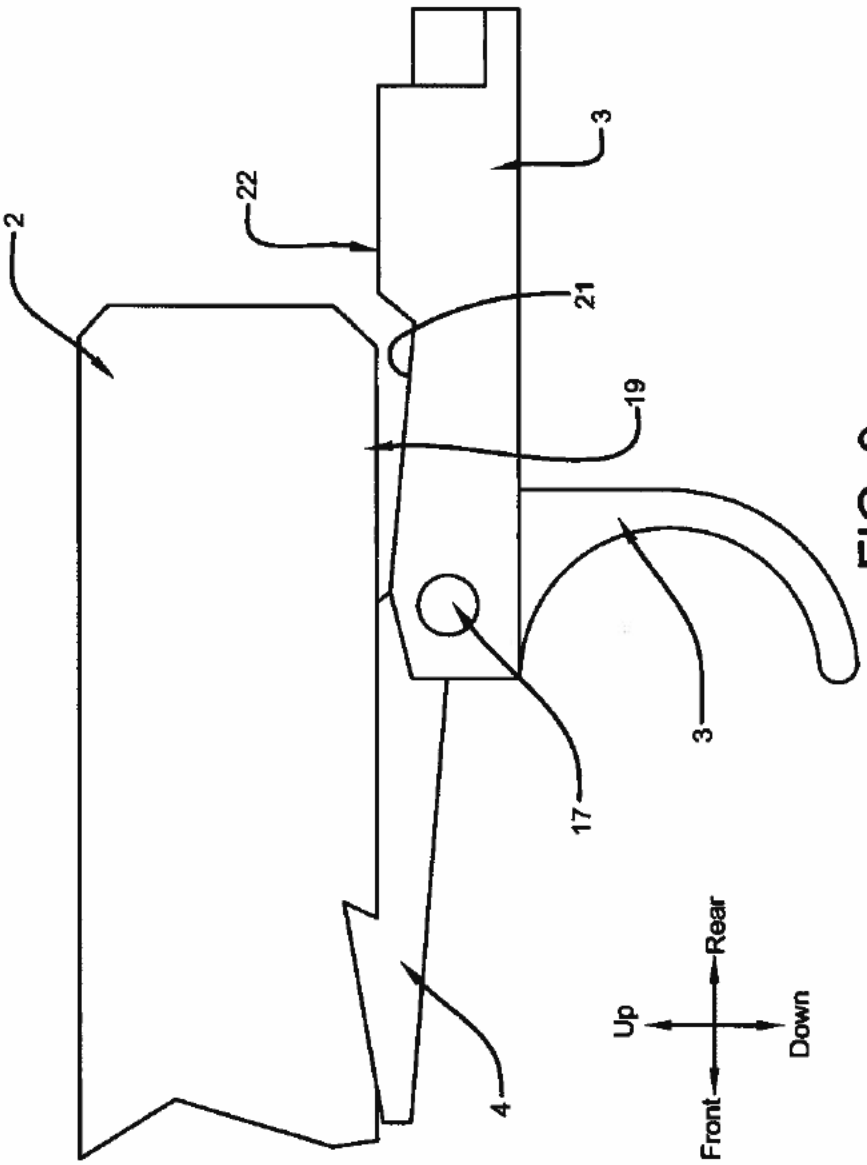


FIG. 3

Attachment G (5 of 8)

FLEX-FIRE TECHNOLOGY

This application is a divisional of U.S. Ser. No. 14/850,380, entitled FLEX-FIRE TECHNOLOGY, filed Sep. 10, 2015, now U.S. Pat. No. 9,568,264, which claims priority to U.S. Ser. No. 62/049,323, entitled FLEX-FIRE TECHNOLOGY, filed Sep. 11, 2014, both of which are incorporated herein by reference.

I. BACKGROUND

A. Field of the Invention

This invention is related to semi-automatic arms and more specifically is related to reciprocating gun bolt driven trigger and integrated safety mechanisms. This invention is primarily focused upon original product type integrated fire control systems of semi-automatic arms as opposed to any external attachments or auxiliary means. This invention is also primarily focused on striker fired semi-automatic arms as opposed to hammer fired semi-automatic arms.

B. Description of Related Art

In the art associated with modern trigger operated semi-automatic arms, it is desirable to secure rapid and repeated shot placement.

The concept of a semi-automatic arm includes a manually activated trigger that fires once per operating cycle. An operating cycle is comprised of two gun bolt strokes. Each operating cycle requires an independent depression and reset of the trigger.

Low Energy Trigger Reset

A popular finger manipulated trigger operating concept is commonly referred to as "trigger reset." This is the prevailing concept of conventional trigger operated semi-automatic arms. In this concept, a trigger is pulled to fire. After the trigger is pulled it must be released to a position of mechanical reset by spring tension before subsequent trigger operating cycles can be accomplished. A device functioning as a disconnector or an equivalent arrangement of devices is used to hold the striker/firing pin until the trigger is reset. In this case, the energy for trigger depression is supplied by the user and the energy for trigger reset is stored user energy via mechanical spring tension. In general practice, reset spring energy is relatively low in order to provide a light trigger pull.

Medium Energy Trigger Reset

A medium energy trigger reset type fire control system can develop more reset stroke energy than a low energy trigger reset system without necessarily increasing trigger pull weight. In a medium energy trigger reset system some fraction of energy transferred from a moving gun bolt is transmitted ultimately to a trigger. This energy increase of the trigger reset is taken from gun bolt operation energy, not trigger depression energy.

Trigger depression energy may be very low (indicating a light trigger pull) while having a relatively faster and/or stronger trigger reset event than otherwise possible. A characteristic of this system is that if one pulls a trigger forcefully enough it will not reset automatically because gun bolt energy is transmitted through a disconnector and then through the trigger that is separated by a spring of higher resistance than the usual trigger reset spring. If force on the trigger exceeds the resistance of this spring then the trigger will not reset but the disconnector will function regardless.

II. SUMMARY

This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key factors or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter.

It is possible by the application of Flex-Fire Technology (FFT) to have a high energy trigger reset system. A high energy trigger reset system implies a trigger that is reset by direct mechanical reaction to a gun bolt without the necessity of a spring system limiting trigger reset energy. Such a system can easily have more trigger reset energy than a finger can apply within a broad range of practical concern. This can assure a more certain reset event under more diverse conditions than is otherwise possible, and also allows for further design flexibilities that were previously unobtainable. The FFT reset system is capable of maximized trigger reset energy and trigger spring weight is independent of trigger reset energy. FFT can provide the basic advantages of true high energy trigger reset technology within the context of a trigger operated semi-automatic arm suited for industry wide applications.

According to some embodiments of this invention, a handheld finger activated semi-automatic arm may comprise: a frame; a chamber face that is supported to the frame and that comprises a barrel; a trigger that is depressible to fire the arm once per operating cycle; a gun bolt that is movable rearward and forward with respect to the frame; and, a trigger reset mechanism comprising rigid mechanical contact between the trigger and the gun bolt during an earliest 50% of the operating cycle. The trigger may be blocked from depression by the rigid mechanical contact between the trigger and the gun bolt up to 99% of the operating cycle.

According to other embodiments of this invention, a handheld finger activated semi-automatic arm may comprise: a frame; a chamber face that is supported to the frame and that comprises a barrel; a trigger that is depressible to fire the arm once per operating cycle; and, a gun bolt that is movable with respect to the frame rearward away from the chamber concurrent with the trigger being positively mechanically reset. The trigger may be blocked from depression until up to 99% of the operating cycle.

According to still other embodiments of this invention, a handheld finger activated semi-automatic arm may also comprise: a safety lock that engages a sear surface on a disconnector to prevent trigger depression.

According to yet other embodiments of this invention, a handheld finger activated semi-automatic arm may also comprise: a striker having an integrated sear surface; a striker biasing member that biases the striker toward a forward position; a disconnector having: a first sear surface in contact with the striker sear surface; a second sear surface; and, a pivot that is rearward of the striker sear surface and forward of the disconnector second sear surface; and, a safety lock that is adjustable between: a locked condition which prevents the trigger from being depressed and an unlocked condition which permits the trigger to be depressed. The safety lock may contact the disconnector second sear surface when the safety lock is in the locked condition. The safety lock may be out of contact with the disconnector second sear surface when the safety lock is in the unlocked condition. The arm may be operable when the safety lock is in the unlocked condition by depressing the trigger to pivot the disconnector about the disconnector pivot, to move the first disconnector sear surface out of contact with the striker sear surface, to enable the striker biasing member to force the striker to fire the arm.

According to other embodiments of this invention, a handheld finger activated semi-automatic arm may also comprise: a striker having an integrated sear surface; and, a striker biasing member that biases the striker toward a forward position. When the gun bolt is moving forward, the striker compresses the striker biasing member.

According to still other embodiments of this invention, a handheld finger activated semi-automatic arm may also comprise: a striker having an integrated sear surface at a rearward end; and, a striker biasing member that is positioned above or beside the striker from a lengthwise perspective. The striker and striker biasing member may be charged only as the gun bolt moves forward toward the chamber face.

According to yet other embodiments of this invention, a handheld finger activated semi-automatic arm may comprise: a frame; a chamber face that is supported to the frame and that comprises a barrel; a striker having an integrated sear surface at a rearward end; a striker biasing member that is positioned above or beside the striker from a lengthwise perspective; a gun bolt that is movable rearward and forward with respect to the frame; and, a trigger that is depressible to fire the arm. The striker and striker biasing member may be charged only as the gun bolt moves forward toward the chamber face.

Numerous benefits and advantages of this invention will become apparent to those skilled in the art to which it pertains upon reading and understanding of the following detailed specification.

III. BRIEF DESCRIPTION OF THE DRAWINGS

The invention may take physical form in certain parts and arrangement of parts, embodiments of which will be described in detail in this specification and illustrated in the accompanying drawings which form a part hereof and wherein:

FIG. **1** is a side view, in partial cutaway, showing an arm equipped with embodiments of the Flex-Fire Technology of this invention.

FIG. **2** shows portions of the arm of FIG. **1** separated for clarity.

FIG. **3** shows portions of an arm with components similar to those shown in FIG. **1** but with numerous components removed for clarity. The gun bolt is shown in the full frontward position and the trigger is shown in the non-depressed position.

IV. DETAILED DESCRIPTION

Referring now to the drawings wherein the showings are for purposes of illustrating embodiments of the invention only and not for purposes of limiting the same, and wherein like reference numerals are understood to refer to like components, following is a list of components according to some embodiments of this invention:

1: A frame (stationary part)
2: A gun bolt (reciprocating type)
3: A trigger
4: A disconnector (integrated safety sear type)
5: A safety lock
6: A safety transfer bar
7: A safety paddle (engagement device)
8: A buffer (elastic bushing type)
9: A striker (integrated sear type)
10: A striker biasing member which may be a spring (helical compression type)

11: A main recoil biasing member which may be a spring (helical compression type)
12: A chamber face (barrel and chamber assembly)
13: A magazine (standard box magazine—details omitted for clarity)
14: A disconnector biasing member which may be a spring (helical compression type)
15: A safety biasing member which may be a spring (helical compression type)
16: Sear surface of disconnector **4**
17: Pivot
18: Sear surface of striker **9**
19: Bottom surface of gun bolt **2**
20: Sear surface of disconnector **4**
21: Space between gun bolt **2** and trigger **3**
22: Top surface of trigger **3**

With reference now to FIGS. **1**, **2** and **3**, Flex-Fire Technology (FFT), is designed to fire common cartridge type ammunition (not shown) from within chamber **12**. The system is operated by hand and trigger **3** is finger activated by depressing trigger **3** in the rearward direction. In order to initiate an operational cycle from the loaded chamber **12**, safety paddle **7** may be depressed towards the chamber **12** by user energy. This depression moves safety transfer bar **6** against biasing member **15** and simultaneously pivots safety lock **5** towards the chamber **12** (clockwise). When the safety lock **5** is depressed to a given extent, it swings clear of sear surface **16** on the disconnector **4**. Once the disconnector **4** and trigger **3** are free to swing upwards (counterclockwise) the FFT is ready to fire a cartridge.

Depression of the trigger **3** by a user will now result in a cartridge being fired and an operational cycle to be completed to the extent of reloading chamber **12** from magazine **13** in preparation for a subsequent depression of the trigger **3**. Reloading details have been omitted for clarity.

Upon depression of the trigger **3**, the trigger **3** and the disconnector **4** will pivot upwards (counterclockwise) about pivot **17** farthest from the chamber **12**. Note in FIG. **3** the space **21** between the top of the trigger **3** and the bottom of the gun bolt **2** that provides room for this pivoting motion when the gun bolt **2** is positioned forward. The disconnector **4** acts against a disconnector biasing member **14** and is pulled downward at any point forward of the trigger pivot **17**. As the disconnector **4** breaks contact with sear surface **18** on striker **9**, striker **9** will react against striker biasing member **10** and fire a cartridge via stored kinetic energy.

Ultimately, as a cartridge is fired and a bullet is propelled away from the gun bolt **2**, subsequent recoil energy pushes the cartridge case away from the chamber **12**—pushing the gun bolt **2** rearwardly in the process. During this movement the cartridge case will travel at least its own original length while in direct contact with the gun bolt **2** and then it will be ejected in the usual manner, which has been omitted for clarity. The ejection function, including the compression of main recoil biasing member **11**, is performed in parallel with overall fire control group reset.

During the earliest rearward movement of the gun bolt **2**, the trigger **3** is forced to reset by interference contact with the gun bolt **2**. Specifically, in one embodiment shown in FIG. **3**, bottom surface **19** of the gun bolt **2** contacts upper surface **22** of the trigger **3** as the gun bolt **2** moves rearward. The gun bolt **2** may then hold down the trigger **3** throughout the remaining rearward movement. During this movement the disconnector **4** is elastically displaced (compressing disconnector biasing member **14**) as striker **9** passes over it.

When the gun bolt **2** has reached its most rearward position, the trigger **3** is already reset and held in place by the gun bolt **2**.

As the gun bolt **2** begins to move frontward towards the chamber **12** under force from recoil biasing member **11**, disconnector **4** sear surface **20** will catch the sear surface **18** of the striker **9** and begin to react against a striker biasing member **10**. A new cartridge is simultaneously stripped from a magazine **13** and begins to be pushed by the gun bolt **2** towards the chamber **12**. When the gun bolt **2** arrives at its most forward position, a new cartridge will have been loaded in the chamber **12** and the trigger **3** will be clear of interference with the gun bolt **2**. This completes a single operating cycle of two strokes. One complete operating cycle is considered 100% of the operating cycle. Subsequent operating cycles can be initiated by subsequent depressions of the trigger **3**. Note that in some embodiments, such as shown in FIG. **3**, the trigger **3** is blocked from depression by the rigid mechanical contact between the trigger **3** and the gun bolt **2** up to 99% of the operating cycle. The precise percent of the operating cycle can be adjusted to other percentages by a person of skill in the art.

Elaborations

The striker **9** is energized as the gun bolt **2** returns to a most forward position effectively reducing secondary rebound from the chamber face **12**.

The trigger **3** may be positively mechanically reset approximately as early as the first 10% of the operating cycle. This may give the user the longest possible time to sense and/or react to the reset event without increasing the overall time between operating cycles.

Clearances between the interference of the trigger **3** and the gun bolt **2** may be adjusted to allow the trigger **3** to be depressed slightly before the most forward movement of the gun bolt **2**. In rapid fire operation, this allows for lower "running" trigger pull weight and concurrently shorter striker strokes. Earlier trigger **3** depression results in a shorter striker **9** stroke. The striker biasing member **10** compression is proportionate to the length of striker **9** stroke.

The safety system may automatically lock the trigger **3**, the disconnector **4** and the gun bolt **2** simultaneously with a single safety lock **5** upon release of the safety paddle **7** that reacts against safety biasing member **15**. The trigger **3** and the disconnector **4** are locked via hook function of the safety lock **5**.

When the safety lock **5** is in a locked position, a gun bolt **2** can be in interference with the safety lock **5** and therefore cannot be pulled rearward to cycle a gun bolt **2**. In this case, manual operation of the gun bolt **2** requires the safety paddle **7** to be depressed in order to unlock the gun bolt **2**.

Ramifications

Self-preservation is the ultimate common determinant of human demands and world history has most certainly indicated that the biggest threat to human beings is found within the same species. The need for more and more advantageous means to defend interest and project interest should be well understood by many people of all cultures familiar to international trade and influence. History also indicates that many, if not the majority of those human versus human threats are acted out at close range with various types of combat tools.

Pistols, carbines, and rifles are primary tools of survival within the scope of modern civilization. These tools are among the most desirable close range fighting tools and are totally indispensable within the context of a civilization of free persons. All free people demand an ability to control and apply the most effective means of self-defense possible.

Flex-Fire Technology is devised to provide a free people a practical means to more effectively defend or project interest at close ranges against other highly developed combat tools that may be applied against them.

This technology provides the potential of increasing both the rate of fire and the precision of fire at higher rates beyond the fundamental design capabilities of pre-existing semi-automatic arms.

Numerous embodiments have been described herein. It will be apparent to those skilled in the art that the above methods and apparatuses may incorporate changes and modifications without departing from the general scope of this invention. It is intended to include all such modifications and alterations in so far as they come within the scope of the appended claims or the equivalents thereof. Further, the "invention" as that term is used in this document is what is claimed in the claims of this document. The right to claim elements and/or sub-combinations that are disclosed herein as other inventions in other patent documents is hereby unconditionally reserved.

I claim:

1. A handheld finger activated semi-automatic arm comprising:

a frame;

a chamber face that is supported to the frame and that comprises a barrel;

a trigger that is depressible to fire the arm once per operating cycle;

a gun bolt that is movable with respect to the frame rearward away from the chamber concurrent with the trigger being positively mechanically reset; and,

wherein the trigger is blocked from depression until up to 99% of the operating cycle.

2. The handheld finger activated semi-automatic arm of claim **1** further comprising:

a safety lock that engages a sear surface on a disconnector to prevent trigger depression.

3. The handheld finger activated semi-automatic arm of claim **1** further comprising:

a striker having an integrated sear surface;

a striker biasing member that biases the striker toward a forward position;

a disconnector having: a first sear surface in contact with the striker sear surface; a second sear surface; and, a pivot that is rearward of the striker sear surface and forward of the disconnector second sear surface;

a safety lock that is adjustable between: a locked condition which prevents the trigger from being depressed and an unlocked condition which permits the trigger to be depressed;

wherein the safety lock contacts the disconnector second sear surface when the safety lock is in the locked condition;

wherein the safety lock is out of contact with the disconnector second sear surface when the safety lock is in the unlocked condition; and,

wherein the arm is operable when the safety lock is in the unlocked condition by depressing the trigger to pivot the disconnector about the disconnector pivot, to move the first disconnector sear surface out of contact with the striker sear surface, to enable the striker biasing member to force the striker to fire the arm.

4. The handheld finger activated semi-automatic arm of claim **1** further comprising:

a striker having an integrated sear surface;

a striker biasing member that biases the striker toward a forward position; and,

wherein when the gun bolt is moving forward the striker compresses the striker biasing member.

5. The handheld finger activated semi-automatic arm of claim **1** further comprising:

a striker having an integrated sear surface at a rearward end;

a striker biasing member that is positioned above or beside the striker from a lengthwise perspective; and,

wherein the striker and striker biasing member are charged only as the gun bolt moves forward toward the chamber face.

* * * * *

US009939221B2

(12) United States Patent
Graves

(10) Patent No.: US 9,939,221 B2
(45) Date of Patent: Apr. 10, 2018

(54) **FLEX-FIRE G2 TECHNOLOGY**

(71) Applicant: **Thomas Allen Graves**, Buda, TX (US)

(72) Inventor: **Thomas Allen Graves**, Buda, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/811,212**

(22) Filed: **Nov. 13, 2017**

(65) **Prior Publication Data**

US 2018/0066911 A1 Mar. 8, 2018

Related U.S. Application Data

(60) Continuation-in-part of application No. 15/421,730, filed on Feb. 1, 2017, now Pat. No. 9,816,772, which is a division of application No. 14/850,380, filed on Sep. 10, 2015, now Pat. No. 9,568,264.

(60) Provisional application No. 62/049,323, filed on Sep. 11, 2014.

(51) **Int. Cl.**

F41A 19/16	(2006.01)
F41A 17/46	(2006.01)
F41A 3/68	(2006.01)

(52) **U.S. Cl.**

CPC ***F41A 17/46*** (2013.01); ***F41A 3/68*** (2013.01); ***F41A 19/16*** (2013.01)

(58) **Field of Classification Search**

CPC F41A 19/10; F41A 19/16; F41A 19/17; F41A 19/24

USPC 42/69.01, 69.02

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

571,260	A	11/1896	Borchardt	
580,925	A	4/1897	Browning	
2,618,878	A *	11/1952	Mulno	F41A 3/68 42/16
3,631,620	A *	1/1972	Ohira	F41A 3/22 42/16
3,657,959	A	4/1972	Kart	
4,127,056	A	11/1978	Kart	
4,253,377	A	3/1981	Arnett	
4,455,777	A	6/1984	Callies	
4,459,774	A	7/1984	Ferretti	
4,539,889	A	9/1985	Glock	
4,735,009	A	4/1988	Jett, Jr.	
4,955,157	A	9/1990	Brighton et al.	
5,036,612	A	8/1991	Jennings	
7,398,723	B1	7/2008	Blakley	
8,448,366	B2	5/2013	Faifer	
8,701,326	B2	4/2014	Zonshine	
9,021,732	B2	5/2015	Johnson	
2011/0289813	A1	12/2011	Serandour	
2014/0366418	A1	12/2014	Stakes	
2015/0184967	A1	7/2015	Whittington	
2017/0089654	A1 *	3/2017	Findlay	F41A 3/66

FOREIGN PATENT DOCUMENTS

GB	18774	11/1893

OTHER PUBLICATIONS

http://tacconusa.com/ Tac Con 3MR Trigger System.

* cited by examiner

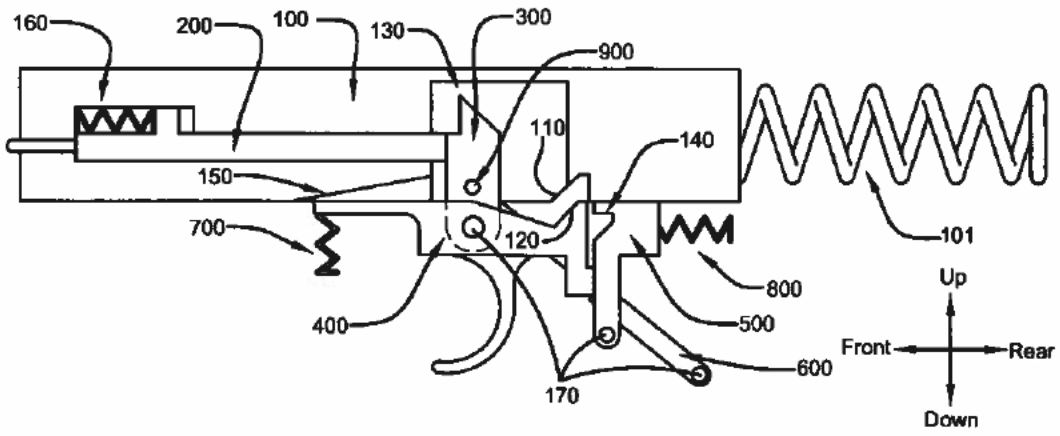
Primary Examiner — Reginald Tillman, Jr.

(74) *Attorney, Agent, or Firm* — Timothy D. Bennett; Emerson Thomson Bennett

(57) **ABSTRACT**

A trigger activated arm may use engagement of an integrated gun bolt cam with an integrated trigger cam to reposition the trigger as the gun bolt reciprocates. The gun bolt trigger engagement may be used to reset the trigger.

20 Claims, 5 Drawing Sheets



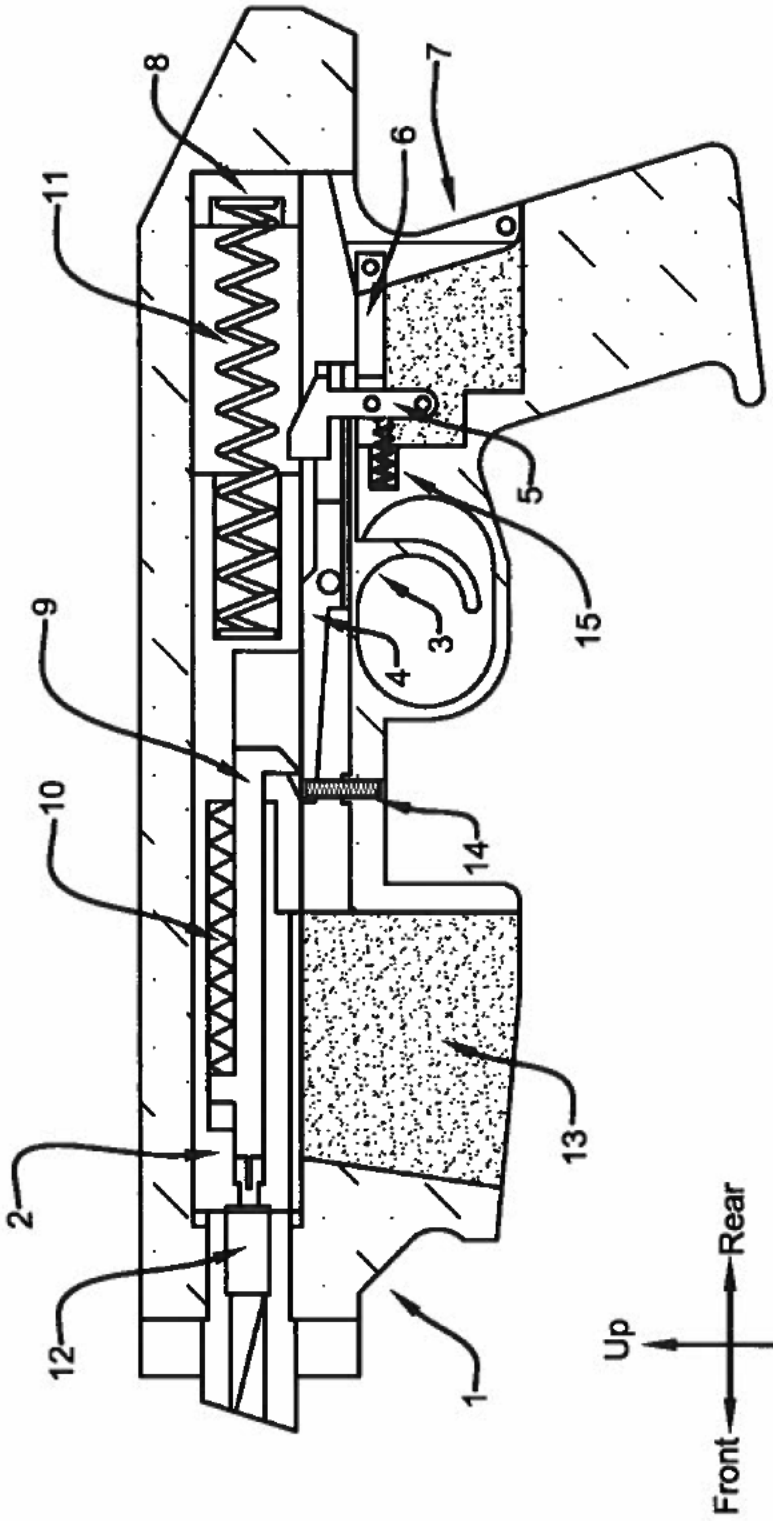


FIG.1

Attachment H (3 of 11)

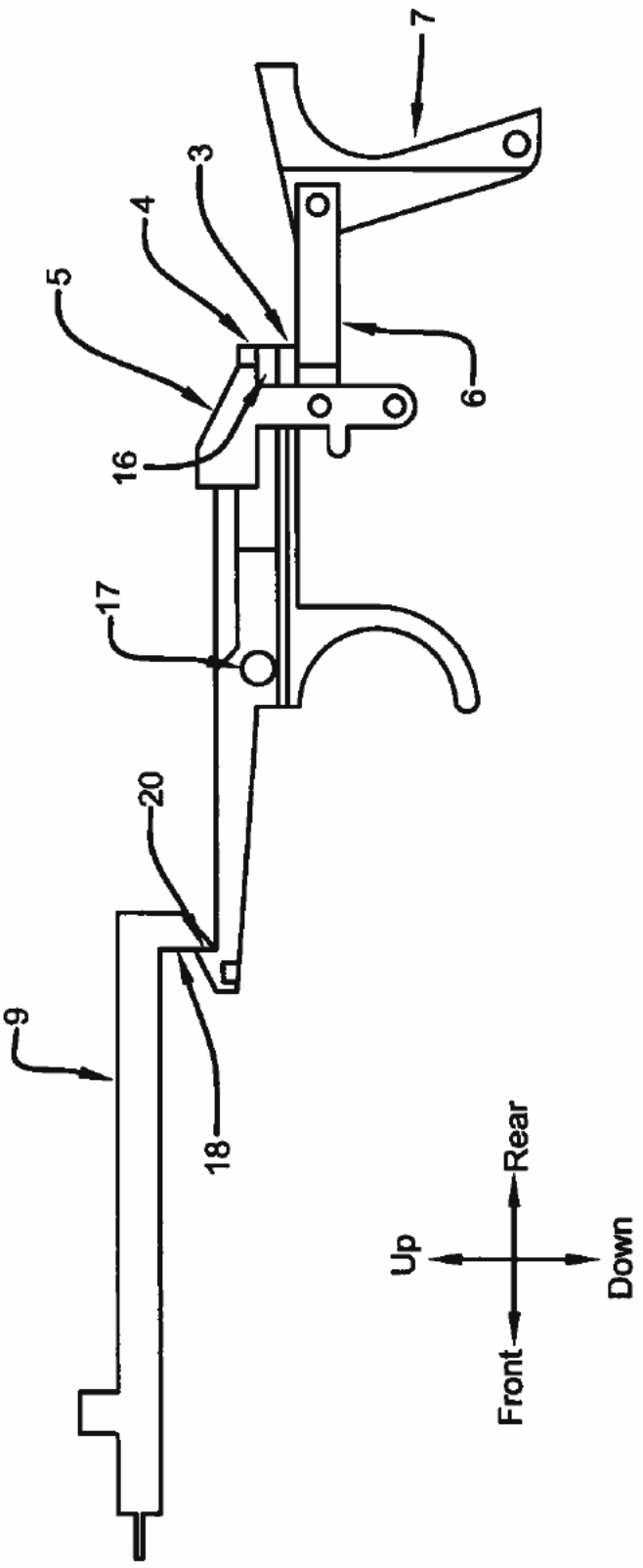


FIG. 2

Attachment H (4 of 11)

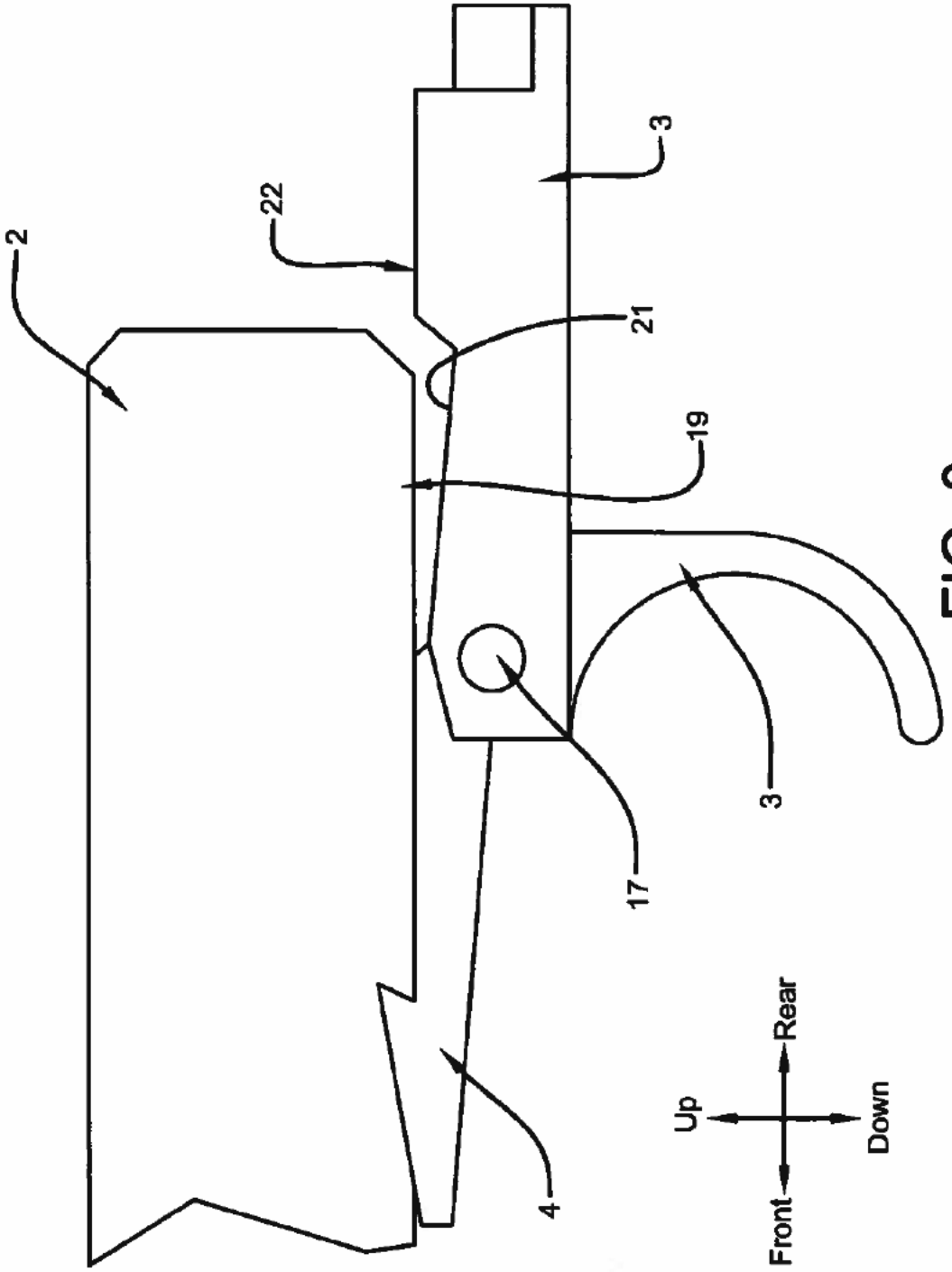


FIG. 3

Attachment H (50 pp)

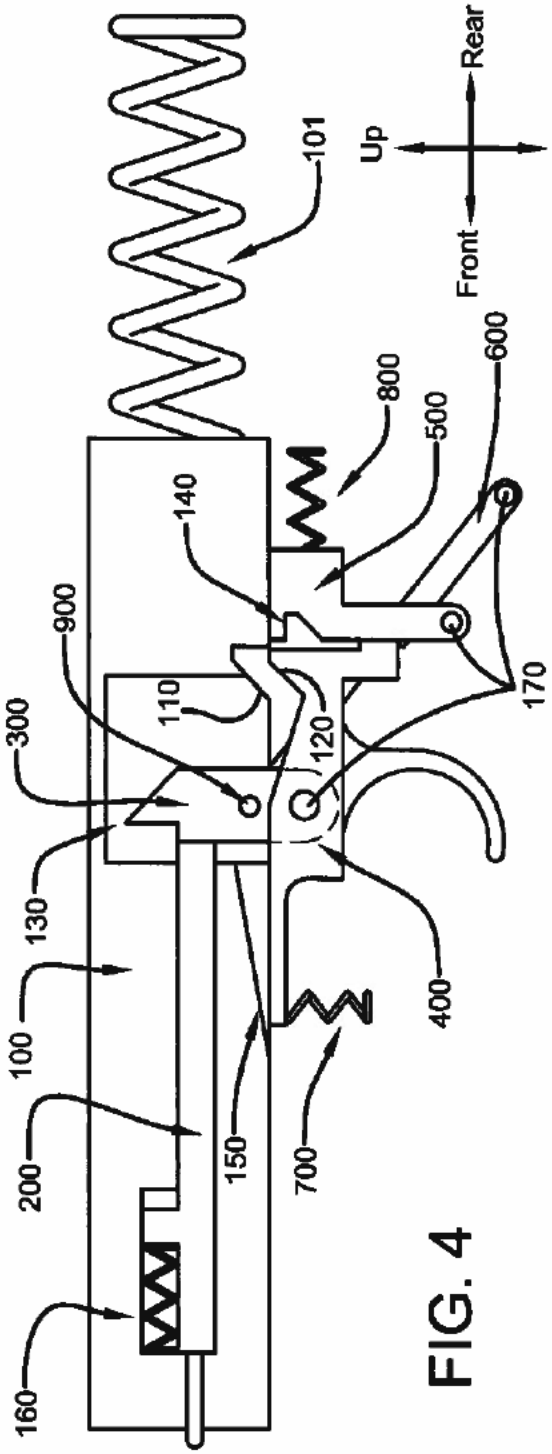


FIG. 4

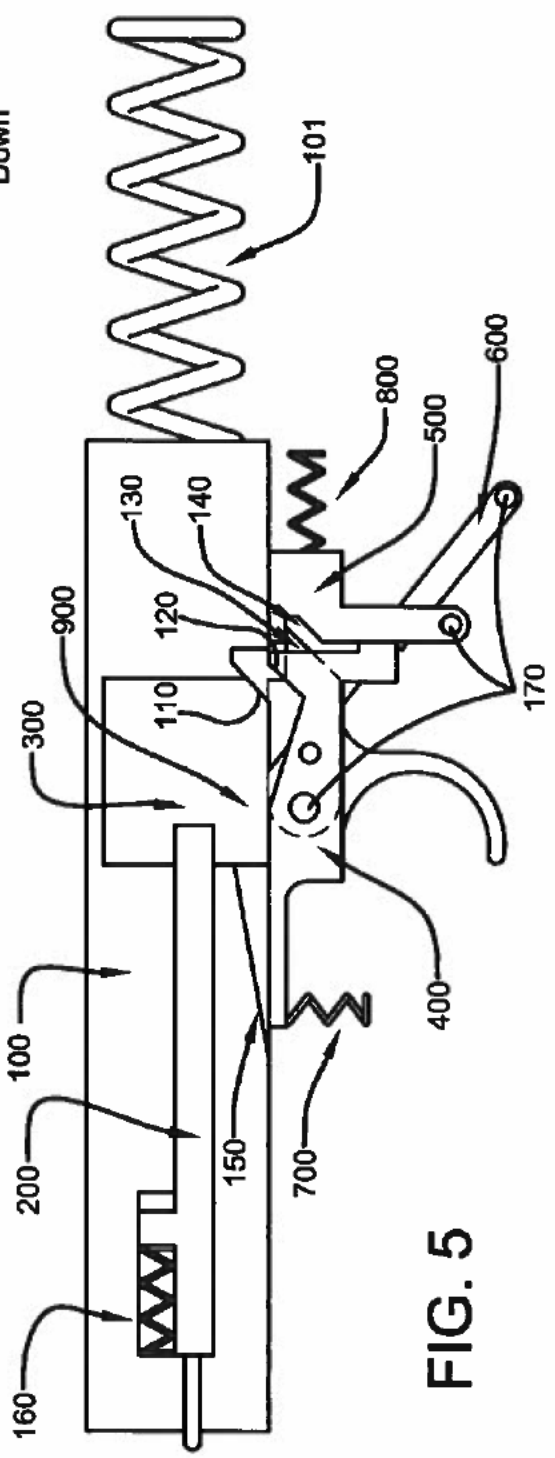


FIG. 5

Attachment H (6 of 11)

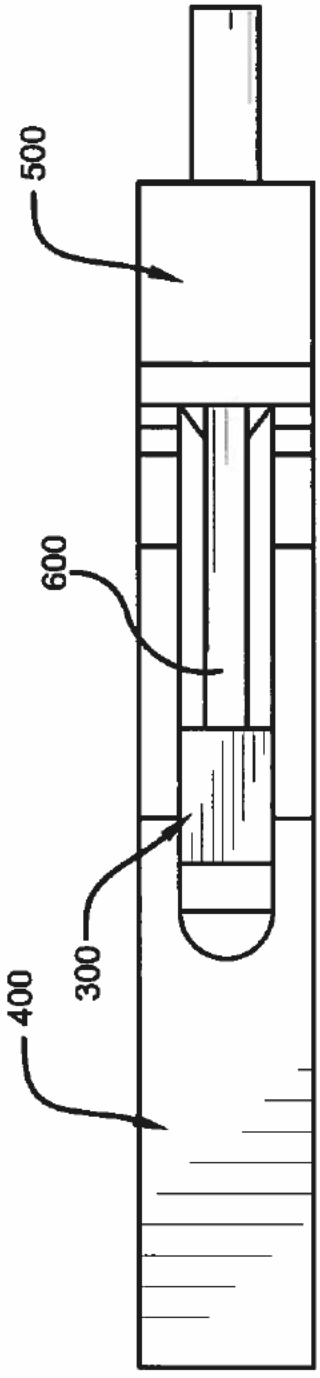


FIG. 6

FLEX-FIRE G2 TECHNOLOGY

This application is a Continuation-in-Part of U.S. Pat. No. 9,816,772 entitled FLEX-FIRE TECHNOLOGY, which is a divisional of U.S. Pat. No. 9,568,264 entitled FLEX-FIRE TECHNOLOGY, which claims priority to provisional patent application U.S. Ser. No. 62/049,323, entitled FLEX-FIRE TECHNOLOGY, all of which are incorporated herein by reference.

I. BACKGROUND

A. Field of the Invention

My present subject is high energy trigger reset methods and apparatus that include hammer fired, gun bolt driven automatic trigger reset technology that is herein referred to as FLEX-FIRE G2 TECHNOLOGY. The following is a specification of my invention, including attached drawings. This specification is intended to be understood by a person skilled in the mechanical arts inclusive of modern semi-automatic arms.

B. Description of Related Art

In the art of trigger activated small arms it may be increasingly desirable to be capable of more rapidly repeatable, and more accurate shot placement, or in any way to decrease repeatable operating cycle duration within mechanical practicality.

The concept of a semi-automatic arm includes a manually activated trigger that fires once per operating cycle. In the case of a small arm with a reciprocating gun bolt an operating cycle is comprised of two strokes of the gun bolt. One stroke is rearward, one stroke is forward. Each operating cycle requires an independent depression of the trigger to initiate, and also requires a reset of the trigger per operating cycle to initiate a subsequent operating cycle.

In my technical writing that is dated Sep. 11, 2014, with revisions thereof ultimately entitled FLEX-FIRE TECHNOLOGY of U.S. Pat. No. 9,568,264, I've introduced a gun bolt driven direct mechanical reset of a trigger. This technology accomplishes digital precision of trigger reset function at any given gun bolt reciprocation rate, and therefore has provided a fundamental basis for futuristic high-speed semi-automatic fire control/operating systems.

Flex-Fire technology proper, in this context, is a technical term referring to high energy trigger reset technology. Basically, this implies that a trigger depression followed by a high energy automatic trigger reset, are accomplished per unit firing cycle. The use of "high" energy in the descriptor is given to indicate a trigger reset force that exceeds the typical force of manual activation, and therefore could be considered a positive displacement trigger reset.

Trigger activated semi-automatic arms that utilize technological claims of U.S. Pat. No. 9,568,264 include a high energy trigger reset method and apparatus having a striker type ignition system.

II. SUMMARY

This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key factors or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter.

According to some embodiments of this invention, a trigger activated arm may include a frame; a barrel that is supported to the frame; a trigger that has an integrated cam surface and is depressible to fire the arm; and, a gun bolt that has an integrated cam surface and reciprocates with respect to the frame. As the gun bolt reciprocates, the gun bolt integrated cam surface may engage the trigger integrated cam surface to reposition the trigger.

According to other embodiments of this invention, a method may include the steps of: (A) providing a trigger activated arm having a frame; a barrel that is supported to the frame; a trigger that has an integrated cam surface and is depressible to fire the arm; and, a gun bolt that has an integrated cam surface and reciprocates with respect to the frame; and, (B) providing the trigger activated arm to be operable to reposition the trigger as the gun bolt reciprocates and the gun bolt integrated cam surface engages the trigger integrated cam surface.

According to other embodiments of this invention, a trigger reset mechanism may use an integrated cam surface on a gun bolt that engages an integrated cam surface on a trigger to reset the trigger into a pre-depressed position as the gun bolt reciprocates.

According to still other embodiments of this invention, mechanical contact between a trigger and a gun bolt may prevent depression of a trigger during any part of the operating cycle except when in battery or within 15% of forward gun bolt stroke.

According to yet other embodiments of this invention, mechanical contact between a trigger and a gun bolt may prevent depression of a trigger during any part of the operating cycle except when in battery or within 10% of forward gun bolt stroke.

According to still other embodiments of this invention, mechanical contact between a trigger and a gun bolt may prevent depression of a trigger during any part of the operating cycle except when in battery or within 5% of forward gun bolt stroke.

Numerous benefits and advantages of this invention will become apparent to those skilled in the art to which it pertains upon reading and understanding of the following detailed specification.

III. BRIEF DESCRIPTION OF THE DRAWINGS

The invention may take physical form in certain parts and arrangement of parts, embodiments of which will be described in detail in this specification and illustrated in the accompanying drawings which form a part hereof and wherein:

FIG. **1** is a side view, in partial cutaway, showing an arm equipped with embodiments of the Flex-Fire Technology of this invention.

FIG. **2** shows portions of the arm of FIG. **1** separated for clarity.

FIG. **3** shows portions of an arm with components similar to those shown in FIG. **1** but with numerous components removed for clarity. The gun bolt is shown in the full frontward position and the trigger is shown in the non-depressed position.

FIG. **4** is a side view, in partial cutaway, showing portions of an arm equipped with embodiments of the Flex-Fire G2 Technology of this invention with the hammer in an uncocked position.

FIG. **5** is a view similar to that shown in FIG. **4** but with the hammer in a cocked position.

FIG. **6** is a top view of the arm shown in FIG. **4**.

IV. DETAILED DESCRIPTION

Referring now to the drawings wherein the showings are for purposes of illustrating embodiments of the invention

Attachment H (3 of 11)

only and not for purposes of limiting the same, and wherein like reference numerals are understood to refer to like components, following is a list of components according to some embodiments of this invention:

1: A frame (stationary part)
2: A gun bolt (reciprocating type)
3: A trigger
4: A disconnector (integrated safety sear type)
5: A safety lock
6: A safety transfer bar
7: A safety paddle (engagement device)
8: A buffer (elastic bushing type)
9: A striker (integrated sear type)
10: A striker biasing member which may be a spring (helical compression type)
11: A main recoil biasing member which may be a spring (helical compression type)
12: A chamber face (barrel and chamber assembly)
13: A magazine (standard box magazine—details omitted for clarity)
14: A disconnector biasing member which may be a spring (helical compression type)
15: A safety biasing member which may be a spring (helical compression type)
16: Sear surface of trigger **3**
17: Pivot
18: Sear surface of striker **9**
19: Bottom surface of gun bolt **2**
20: Sear surface of disconnector **4**
21: Space between gun bolt **2** and trigger **3**
22: Top surface of trigger **3**

With reference now to FIGS. **1**, **2** and **3**, Flex-Fire Technology (FFT), is designed to fire common cartridge type ammunition (not shown) from within chamber **12**. The system is operated by hand and trigger **3** is finger activated by depressing trigger **3** in the rearward direction. In order to initiate an operational cycle from the loaded chamber **12**, safety paddle **7** may be depressed towards the chamber **12** by user energy. This depression moves safety transfer bar **6** against biasing member **15** and simultaneously pivots safety lock **5** towards the chamber **12** (clockwise). When the safety lock **5** is depressed to a given extent, it swings clear of sear surface **16** on the trigger **3**. Once the trigger **3** and disconnector **4** are free to swing upwards (counterclockwise) around pivot **17**, the FFT is ready to fire a cartridge.

Depression of the trigger **3** by a user will now result in a cartridge being fired and an operational cycle to be completed to the extent of reloading chamber **12** from magazine **13** in preparation for a subsequent depression of the trigger **3**. Reloading details have been omitted for clarity.

Upon depression of the trigger **3**, the trigger **3** and the disconnector **4** will pivot upwards (counterclockwise) about pivot **17** farthest from the chamber **12**. Note in FIG. **3** the space **21** between the top of the trigger **3** and the bottom of the gun bolt **2** that provides room for this pivoting motion when the gun bolt **2** is positioned forward. The disconnector **4** acts against a disconnector biasing member **14** and is pulled downward at any point forward of the trigger pivot **17**. As the disconnector **4** breaks contact with sear surface **18** on striker **9**, striker **9** will react against striker biasing member **10** and fire a cartridge via stored kinetic energy.

Ultimately, as a cartridge is fired and a bullet is propelled away from the gun bolt **2**, subsequent recoil energy pushes the cartridge case away from the chamber **12**—pushing the gun bolt **2** rearwardly in the process. During this movement the cartridge case will travel at least its own original length while in direct contact with the gun bolt **2** and then it will be ejected in the usual manner, which has been omitted for clarity. The ejection function, including the compression of main recoil biasing member **11**, is performed in parallel with overall fire control group reset.

During the earliest rearward movement of the gun bolt **2**, the trigger **3** is forced to reset by interference contact with the gun bolt **2**. Specifically, in one embodiment shown in FIG. **3**, bottom surface **19** of the gun bolt **2** contacts upper surface **22** of the trigger **3** as the gun bolt **2** moves rearward. The gun bolt **2** may then hold down the trigger **3** throughout the remaining rearward movement. During this movement the disconnector **4** is elastically displaced (compressing disconnector biasing member **14**) as striker **9** passes over it. When the gun bolt **2** has reached its most rearward position, the trigger **3** is already reset and held in place by the gun bolt **2**.

As the gun bolt **2** begins to move frontward towards the chamber **12** under force from recoil biasing member **11**, disconnector **4** sear surface **20** will catch the sear surface **18** of the striker **9** and begin to react against a striker biasing member **10**. A new cartridge is simultaneously stripped from a magazine **13** and begins to be pushed by the gun bolt **2** towards the chamber **12**. When the gun bolt **2** arrives at its most forward position, a new cartridge will have been loaded in the chamber **12** and the trigger **3** will be clear of interference with the gun bolt **2**. This completes a single operating cycle of two strokes. One complete operating cycle is considered 100% of the operating cycle. Subsequent operating cycles can be initiated by subsequent depressions of the trigger **3**. Note that in some embodiments, such as shown in FIG. **3**, the trigger **3** is blocked from depression by the rigid mechanical contact between the trigger **3** and the gun bolt **2** up to 99% of the operating cycle. The precise percent of the operating cycle can be adjusted to other percentages by a person of skill in the art.

Elaborations Concerning Flex-Fire Technology

The striker **9** is energized as the gun bolt **2** returns to a most forward position effectively reducing secondary rebound from the chamber face **12**.

The trigger **3** may be positively mechanically reset approximately as early as the first 10% of the operating cycle. This may give the user the longest possible time to sense and/or react to the reset event without increasing the overall time between operating cycles.

Clearances between the interference of the trigger **3** and the gun bolt **2** may be adjusted to allow the trigger **3** to be depressed slightly before the most forward movement of the gun bolt **2**. In rapid fire operation, this allows for lower "running" trigger pull weight and concurrently shorter striker strokes. Earlier trigger **3** depression results in a shorter striker **9** stroke. The striker biasing member **10** compression is proportionate to the length of striker **9** stroke.

The safety system may automatically lock the trigger **3** and the disconnector **4** simultaneously with a single safety lock **5** upon the rearward release of the safety paddle **7** that reacts against safety biasing member **15**. The trigger **3** is locked from depression via hook function of the safety lock **5** applied against the sear surface **16**.

Ramifications Concerning Flex-Fire Technology

Self-preservation is the ultimate common determinant of human demands and world history has most certainly indicated that the biggest threat to human beings is found within the same species. The need for more and more advantageous means to defend interest and project interest should be well understood by many people of all cultures familiar to international trade and influence. History also indicates that

Attachment H (1 of 11)

many, if not the majority of those human versus human threats are acted out at close range with various types of combat tools.

Pistols, carbines, and rifles are primary tools of survival within the scope of modern civilization. These tools are among the most desirable close range fighting tools and are totally indispensable within the context of a civilization of free persons. All free people demand an ability to control and apply the most effective means of self-defense possible.

Flex-Fire Technology is devised to provide a free people a practical means to more effectively defend or project interest at close ranges against other highly developed combat tools that may be applied against them.

This technology provides the potential of increasing both the rate of fire and the precision of fire at higher rates beyond the fundamental design capabilities of pre-existing semi-automatic arms.

With reference now to FIGS. **4**, **5** and **6**, a method of high energy trigger reset that features a depressable trigger in battery, or in firing position, and that also includes a gun bolt driven mechanical reset of a hammer type ignition system may be realized within my Flex-Fire G2 Technology.

My invention becomes embodied within a basic mechanical arrangement of both stationary and moving parts similar to those within known practice. Following is a list of components according to some embodiments of this invention:

100: gun bolt
200: firing pin
300: hammer
400: trigger
500: disconnector
600: cylinder type spring assembly
700: spring
800: spring
900: hammer/hammer spring pivot
101: spring
110: gun bolt notch/ramp; gun bolt integrated cam surface
120: trigger ramp; trigger integrated cam surface
130: hammer sear surface
140: disconnector sear surface/notch
150: hammer re-cocking ramp
160: spring
170: pivot(s)

Referring now to FIGS. **4-6**, my invention is an overall methodology that consists of manually or remotely depressing a trigger **400** towards the rear that will cause an ignition within the chamber/barrel that is not shown for the sake of simplicity but may be similar to that shown in FIG. **1**. According some embodiments, at any given point of an operational cycle concurrent to, or after ignition, the trigger **400** may be repositioned when the gun bolt's integrated cam surface **110** engages the trigger's integrated cam surface **120**. According to other embodiments, at any given point of an operational cycle concurrent to, or after ignition, the trigger **400** may be caused to nearly so, or to fully accomplish a high energy reset to the forward/pre-depressed position, and may become depress-able again at or near the moment that a subsequent ignition event is possible within the chamber/barrel assembly that is not shown for the sake of simplicity. Specifically, the trigger reset mechanism in some embodiments may prevent depression of the trigger during any part of the operating cycle except when in battery or within 15% of the forward bolt stroke. This would give more than 0.250 inch of ignition lead to a 2 inch stroke gun bolt system, which is predictably nominal for certain applications. In other embodiments, the trigger reset mechanism may prevent depression of the trigger during any part of the operating cycle except when in battery or within 10% of the forward bolt stroke. In yet other embodiments, the trigger reset mechanism may prevent depression of the trigger during any part of the operating cycle except when in battery or within 5% of the forward bolt stroke. The specific percentage will depend on the particular application as understood by a person of skill in the art.

Another variation of my invention utilizes a hammer type ignition system that includes a high energy reset function that is realized by depressing a trigger **400** rearward against its own spring **700** pressure to cause a disconnector **500** to be pushed rearward against its own spring **800** pressure, releasing the contact between a hammer sear surface **130** and a disconnector sear surface/notch **140**, resulting in a hammer **300** being held against its own spring **600** pressure, to release upward and forward rotationally (counterclockwise as shown) around a pivot **170** while retained by pivot **900**, from the position shown in FIG. **5** to the position shown in FIG. **4**, resulting in a forcible strike against the rear of a firing pin **200**. The use of "high" energy is provided to indicate a force that exceeds the typical force of manual activation, and therefore could be considered a positive displacement trigger reset. Striking the firing pin **200** against its own spring **160** pressure drives the firing pin **200** forward, causing an ignition within the chamber/barrel that is not shown for the sake of simplicity but may be similar to that shown in FIG. **1**. At this point the integrated trigger cam surface **120** is not engaged to the integrated gun bolt cam surface **110**.

The hammer **300** striking the firing pin **200** will fire a primer of a cartridge within a chamber/barrel that is not shown for the sake of simplicity but may be similar to that shown in FIG. **1**. Upon firing, the gun bolt **100** will be driven by recoil rearward against its own spring pressure **101**. As the gun bolt **100** is moved rearward by the force of recoil, the integrated trigger cam surface **120** will engage with the integrated gun bolt cam surface **110**. This engagement (or interference) will act as a cam action causing the trigger **400** to reposition. In some embodiments, this engagement will automatically reset the trigger to the pre-depressed position. Following this, the hammer **300** will then be re-cocked by the hammer re-cocking ramp **150** (a form which may be integrated into the design of the gun bolt **100**) as the gun bolt **100** continues to move rearward. Upon completion of a rearward bolt stroke, the gun bolt **100** direction reverses and a forward stroke of the gun bolt **100** is driven with its own spring pressure **101**. As the forward motion moves the gun bolt into battery, or firing position, the integrated trigger cam surface **120** and integrated gun bolt cam surface **110** are freed from engagement/interference, and the trigger **400** may be pulled again to initiate a subsequent operating cycle. This operating cycle may be repeated indefinitely. The trigger **400** may be reset within the first few percent of rearward gun bolt stroke, but may be locked and incapable of being pulled again until the last few percent of the forward bolt stroke within each independent operating cycle.

In this particular arrangement, with the trigger **400** being automatically reset during initial rearward reaction to the mass of a projectile moving forward, the operator perception of mechanical motion is effectively minimized. When that factor is combined with the trigger **400** being locked until the last 15% or less of forward gun bolt travel, the result may be maximized recovery or finger dwell duration, between operating cycles, that may allow for maximized controllability, comfort, and dependability.

Attachment H (10 of 11)

Elaborations concerning Flex-Fire 2 Technology

It will become obvious with comprehensive consideration that my invention's basic methodology of positive displacement/high energy trigger reset per unit operating cycle combined with unlocking a trigger at or near being in battery can be accomplished in numerous variations by practical mechanisms. Mechanical contact between the trigger and the gun bolt may be used to prevent depression of the trigger until such depression is desired.

This invention provides an effective, and technologically advantageous means capable of exceeding many features, and capabilities of existing fire control/operating system methodologies whether they are low energy trigger reset, medium energy trigger reset, select-fire, binary trigger, bump-fire, slide-fire, or full-auto only type technologies. I do not limit my invention's applications to any particular ammunition cycling mechanisms, whether hammer fired apparatus, or striker fired apparatus, or otherwise.

No form of my invention may be construed as an "automatic firearm" or machine gun in any technical or lawful manner within American engineering nomenclature or constitutionally established context. The US BATFE defines a machine gun in a very strict technical sense. The US National Firearms Act defines a machine gun as "Any weapon which shoots, is designed to shoot, or can be readily restored to shoot, automatically more than one shot without manual reloading, by a single function of the trigger". This definition is taken to imply a historically well-established concept. This concept effectively limits access to a firearm that may continue to fire automatically in a dead operator's hand or with a single accidental, or incidental trigger depression. In general a trigger may be moved towards, and from the operator, completing an entire trigger operating cycle. There are two distinct trigger functions and a small arm must fire more than one shot per trigger function, or two shots per trigger operating cycle to meet the lawfully accepted definition of an "automatic firearm", or a machine gun. My invention is technically a semi-automatic type operating system that strictly and with digital precision provides a single shot per operating cycle, and this in no way qualifies my Invention as a machine gun, and therefore is not included as a NFA restricted weapon, nor does it necessarily constitute a BATFE controlled firearm of any type.

Ramifications Concerning Flex-Fire 2 Technology

Flex-Fire 2 Technology provides small arms having the potentials of increased rates of fire, precision at higher rates of fire, and user comfort, beyond the capabilities of pre-existing fire control/operating systems.

Numerous embodiments have been described herein. It will be apparent to those skilled in the art that the above methods and apparatuses may incorporate changes and modifications without departing from the general scope of this invention. It is intended to include all such modifications and alterations in so far as they come within the scope of the appended claims or the equivalents thereof. Further, the "invention" as that term is used in this document is what is claimed in the claims of this document. The right to claim elements and/or sub-combinations that are disclosed herein as other inventions in other patent documents is hereby unconditionally reserved.

I claim:

1. A trigger activated arm comprising:
a frame;
a barrel that is supported to the frame;
a trigger that: (1) has an integrated cam surface; and, (2) is depressible to fire the arm; and,
a gun bolt that: (1) has an integrated cam surface; and, (2) reciprocates with respect to the frame;
wherein as the gun bolt reciprocates, the gun bolt integrated cam surface engages the trigger integrated cam surface to reposition the trigger.

2. The trigger activated arm of claim **1** wherein the gun bolt integrated cam surface engages the trigger integrated cam surface to reset the trigger into a pre-depressed position.

3. The trigger activated arm of claim **2** wherein a high energy reset force that exceeds the typical force of manual activation is used to reset the trigger.

4. The trigger activated arm of claim **1** wherein:
the trigger is depressible to fire the arm once per operating cycle;
the gun bolt reciprocates in a rearward stroke and forward stroke; and,
mechanical contact between the trigger and the gun bolt prevents depression of the trigger during any part of the operating cycle except when in battery or within 15% of the forward gun bolt stroke.

5. The trigger activated arm of claim **1** wherein the arm is a semi-automatic arm.

6. The trigger activated arm of claim **1** comprising a hammer that activates a firing pin to fire the arm.

7. The trigger activated arm of claim **1** comprising a striker that fires the arm.

8. A method comprising the steps of:
(A) providing a trigger activated arm comprising:
a frame;
a barrel that is supported to the frame;
a trigger that: (1) has an integrated cam surface; and, (2) is depressible to fire the arm; and,
a gun bolt that: (1) has an integrated cam surface; and, (2) reciprocates with respect to the frame; and,
(B) providing the trigger activated arm to be operable to reposition the trigger as the gun bolt reciprocates and the gun bolt integrated cam surface engages the trigger integrated cam surface.

9. The method of claim **8** wherein step (B) comprises the step of:
providing the trigger activated arm to be operable to reset the trigger into a pre-depressed position as the gun bolt reciprocates and the gun bolt integrated cam surface engages the trigger integrated cam surface.

10. The method of claim **8** wherein step (B) comprises the step of:
providing the trigger activated arm to use a high energy reset force that exceeds the typical force of manual activation to reset the trigger.

11. The method of claim **8** wherein:
step (A) comprises the steps of:
providing the trigger to be depressible to fire the arm once per operating cycle; and,
providing the gun bolt to reciprocate in a rearward stroke and forward stroke; and,
step (B) comprises the step of: providing the trigger activated arm to be operable using mechanical contact between the trigger and the gun bolt to prevent depression of the trigger during any part of the operating cycle except when in battery or within 15% of the forward gun bolt stroke.

12. The method of claim **11** wherein step (B) comprises the step of:
providing the trigger activated arm to be operable using mechanical contact between the trigger and the gun bolt to prevent depression of the trigger during any part of

the operating cycle except when in battery or within 5% of the forward gun bolt stroke.

13. The method of claim **8** wherein step (A) comprises the step of:

providing the trigger activated arm to be a semi-automatic arm.

14. The method of claim **8** wherein step (A) comprises the step of:

providing the trigger activated arm to comprise a hammer that activates a firing pin to fire the arm.

15. The method of claim **8** wherein step (A) comprises the step of:

providing the trigger activated arm to comprise a striker that fires the arm.

16. A trigger reset mechanism for use with a trigger activated arm having: a frame; a barrel that is supported to the frame; a trigger that is depressible to fire the arm; and, a gun bolt that reciprocates with respect to the frame; the trigger reset mechanism comprising:

an integrated cam surface on the gun bolt that engages an integrated cam surface on the trigger to reset the trigger into a pre-depressed position as the gun bolt reciprocates.

17. The trigger reset mechanism of claim **16** wherein the trigger reset mechanism uses a high energy reset force that exceeds the typical force of manual activation.

18. The trigger reset mechanism of claim **16** wherein mechanical contact between the trigger and the gun bolt prevents depression of the trigger during any part of an operating cycle except when in battery or within 15% of a forward gun bolt stroke.

19. The trigger reset mechanism of claim **16** wherein the trigger is automatically reset once per operating cycle.

20. The trigger reset mechanism of claim **16** wherein the trigger is reset during an earliest 50% of an operating cycle.

* * * * *

Attachment T (1 of 10)

US010514223B1

(12) United States Patent
Rounds

(10) **Patent No.: US 10,514,223 B1**
(45) **Date of Patent: Dec. 24, 2019**

(54) **FIREARM TRIGGER MECHANISM**

(71) Applicant: **Wolf Tactical LLC**, Buda, TX (US)

(72) Inventor: **Jeffrey Cooper Rounds**, Buda, TX (US)

(73) Assignee: **Wolf Tactical LLC**, Buda, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/143,624**

(22) Filed: **Sep. 27, 2018**

Related U.S. Application Data

(60) Provisional application No. 62/565,247, filed on Sep. 29, 2017.

(51) **Int. Cl.**

F41A 19/43	(2006.01)
F41A 19/14	(2006.01)
F41A 19/10	(2006.01)
F41A 19/12	(2006.01)
F41A 17/82	(2006.01)

(52) **U.S. Cl.**
CPC ***F41A 19/43*** (2013.01); ***F41A 19/10*** (2013.01); ***F41A 19/12*** (2013.01); ***F41A 19/14*** (2013.01); *F41A 17/82* (2013.01)

(58) **Field of Classification Search**
CPC F41A 19/10; F41A 19/12; F41A 19/14; F41A 19/43; F41A 17/82
USPC 89/136, 139; 42/69.01, 69.02, 69.03
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,704,153	A *	1/1998	Kaminski	F41A 17/063 42/117
6,101,918	A	8/2000	Akins	
6,722,072	B1	4/2004	McCormick	
7,162,824	B1	1/2007	McCormick	
7,213,359	B2	5/2007	Beretta	
7,293,385	B2	11/2007	McCormick	
7,398,723	B1	7/2008	Blakley	

(Continued)

FOREIGN PATENT DOCUMENTS

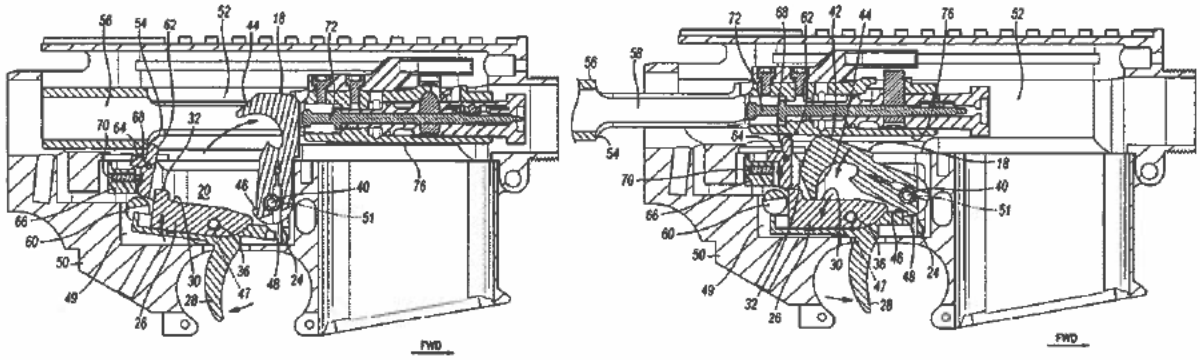
TW	409847	U	10/2000

Primary Examiner — Bret Hayes
(74) *Attorney, Agent, or Firm* — Wood Herron & Evans LLP

(57) **ABSTRACT**

A trigger mechanism for use in a firearm having a receiver with a fire control mechanism pocket, transversely aligned pairs of hammer and trigger pin openings in the pocket, and a bolt carrier that reciprocates and pivotally displaces a hammer when cycled. The trigger mechanism includes a hammer, a trigger member, and a locking bar. The hammer has a sear notch and is mounted in the fire control mechanism pocket to pivot on a transverse hammer pin between set and released positions. The trigger member has a sear and is mounted in the fire control mechanism pocket to pivot on a transverse trigger pin between set and released positions. The trigger member has a surface positioned to be contacted by hammer when the hammer is displaced by cycling of the bolt carrier, the contact causing the trigger member to be forced to the set position. The locking bar is pivotally mounted in a frame and spring biased toward a first position in which it mechanically blocks the trigger member from moving to the release position, and is movable against the spring bias to a second position when contacted by the bolt carrier reaching a substantially in-battery position, allowing the trigger member to be moved by an external force to the released position.

7 Claims, 4 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

8,127,658	B1	3/2012	Cottle	
8,820,211	B1	9/2014	Hawbaker	
9,021,732	B2	5/2015	Johnson	
9,513,076	B2 *	12/2016	Kolev	F41A 3/12
9,568,264	B2	2/2017	Graves	
9,816,772	B2	11/2017	Graves	
9,939,221	B2	4/2018	Graves	
2007/0199435	A1 *	8/2007	Hochstrate	F41A 3/66 89/191.02
2016/0010933	A1	1/2016	Bonner	
2016/0102933	A1	4/2016	Graves	
2017/0219307	A1 *	8/2017	Foster	F41A 19/06
2018/0066911	A1	3/2018	Graves	
2018/0087860	A1 *	3/2018	Sullivan	F41A 17/46

* cited by examiner

Attachment (3 of 10)

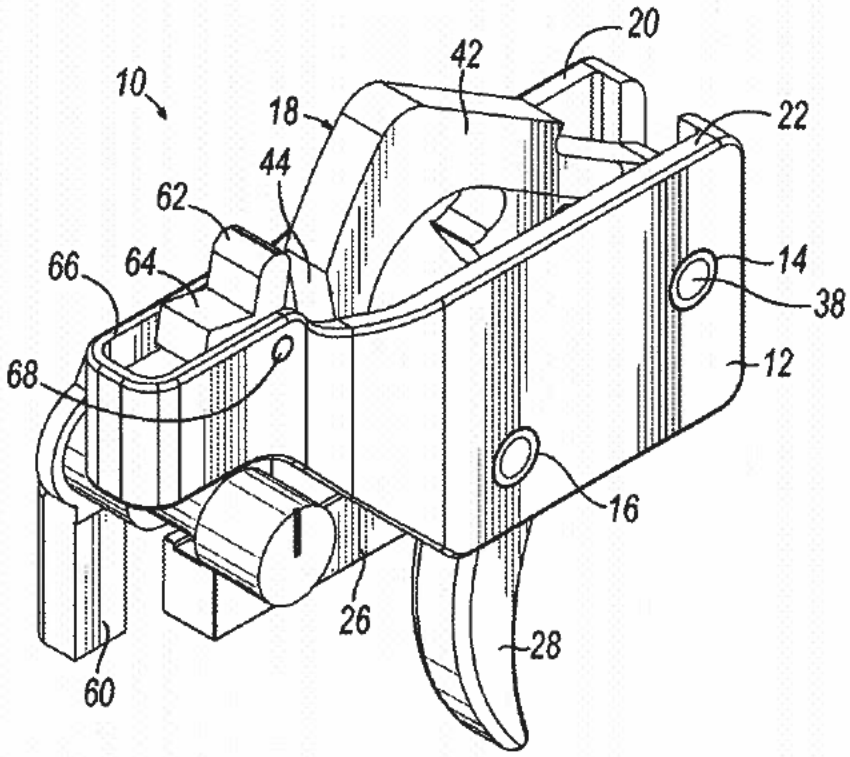


FIG. 1

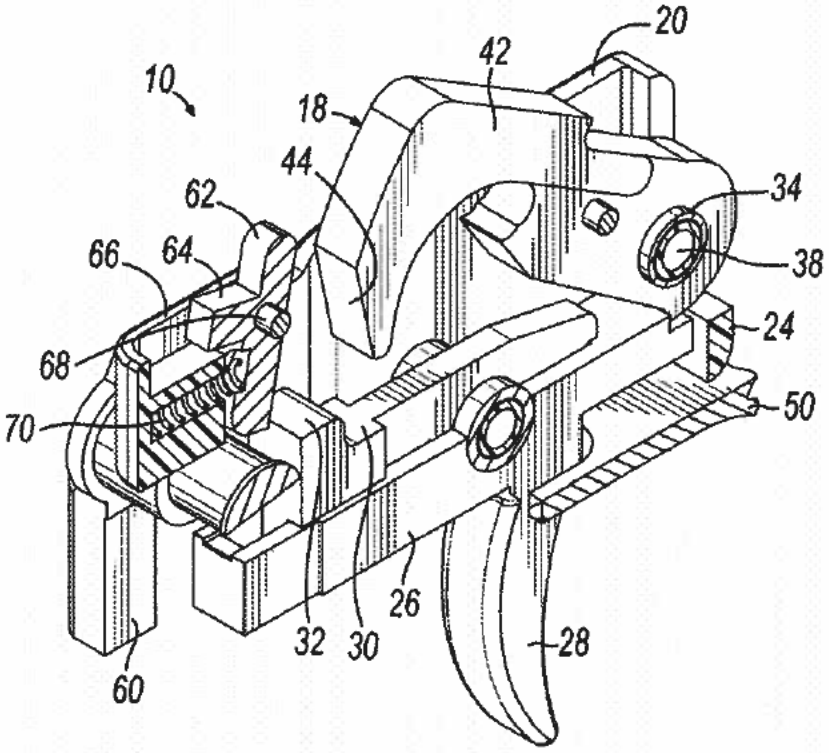


FIG. 2

Attachment I (4 of 14)

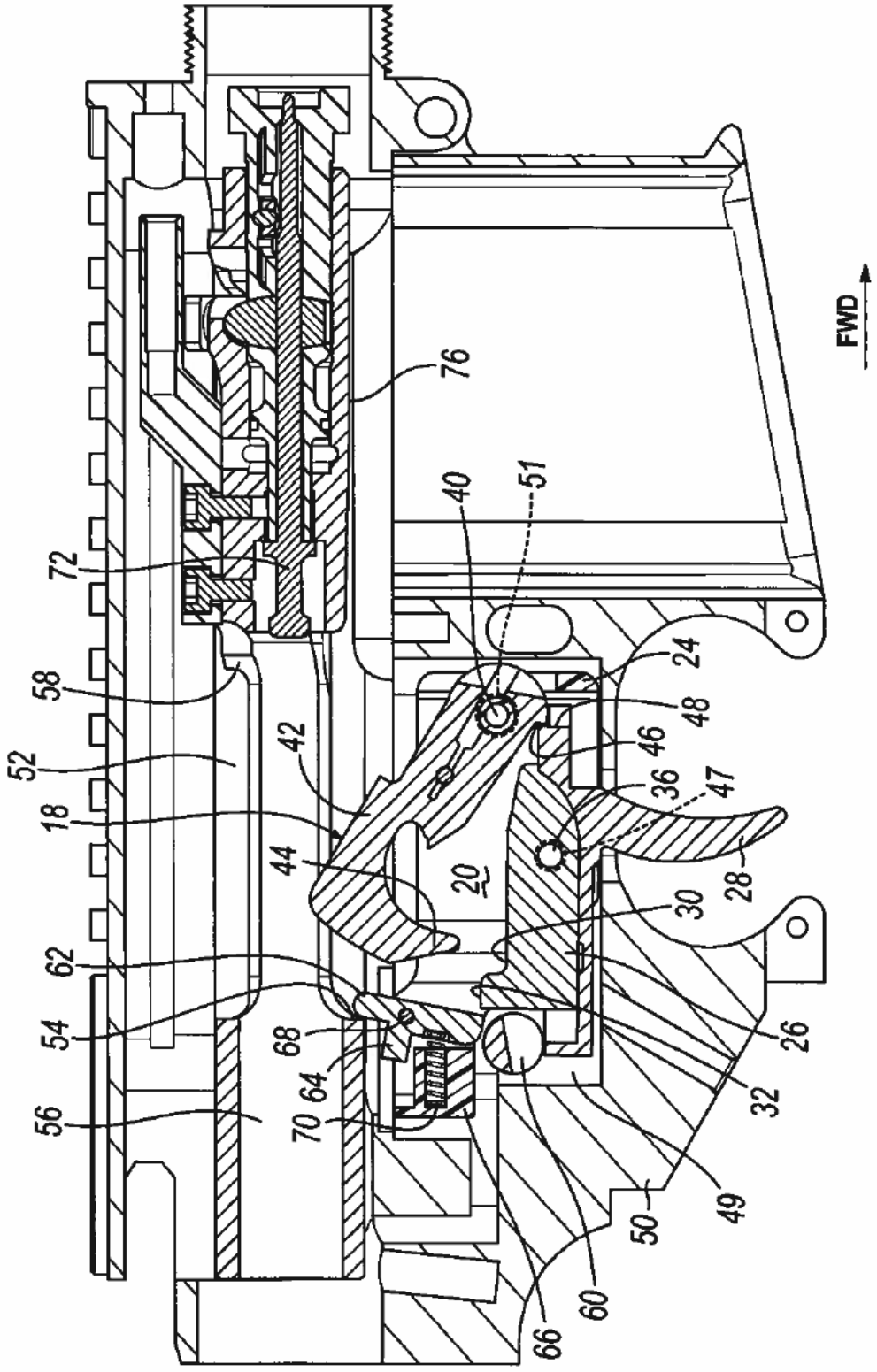


FIG. 3

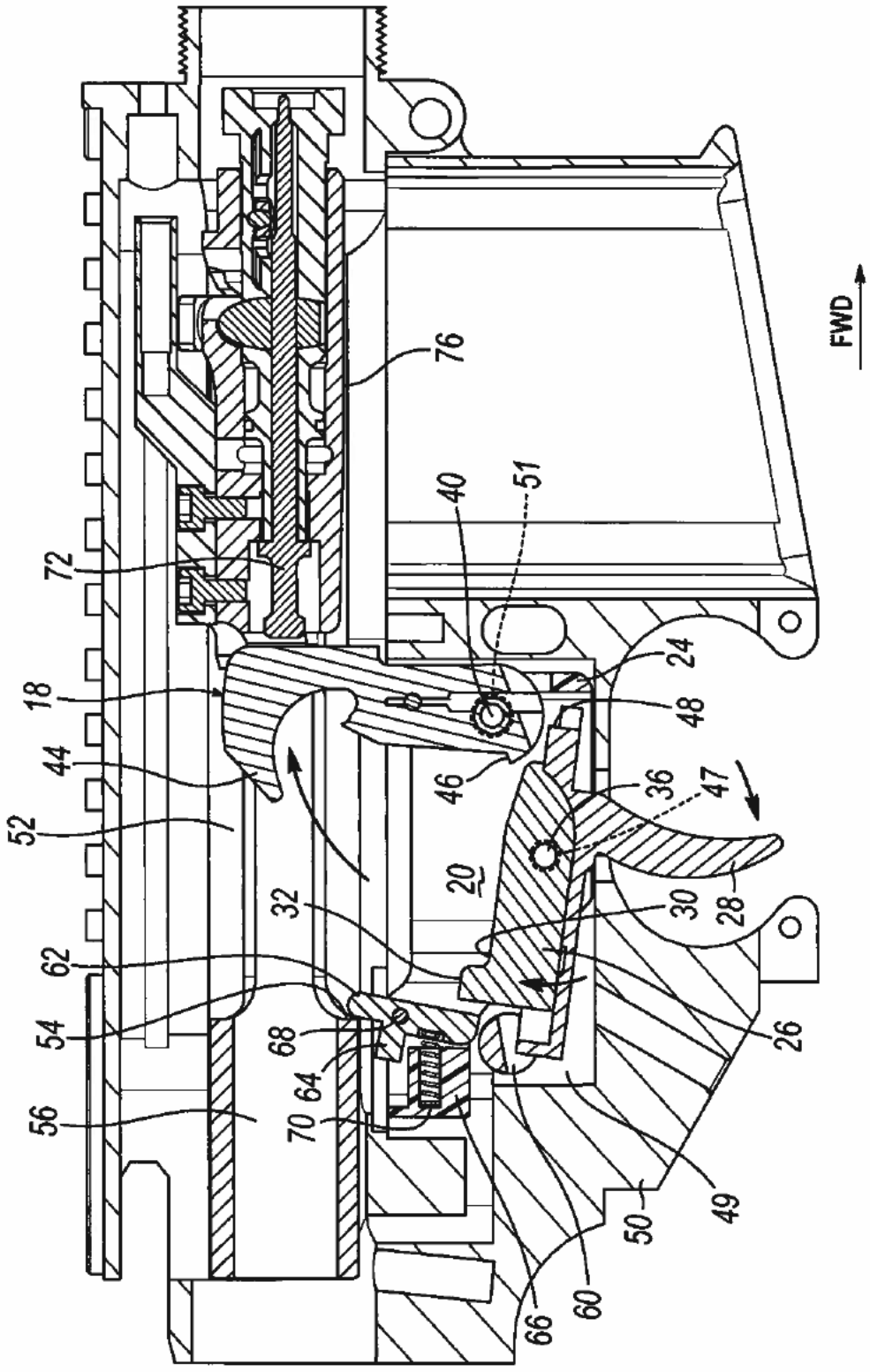

FWD
76
40
51
72
18
24
48
44
46
36
47
52
20
32
30
28
62
54
68
26
64
56
70
49
50
66
60

FIG. 4

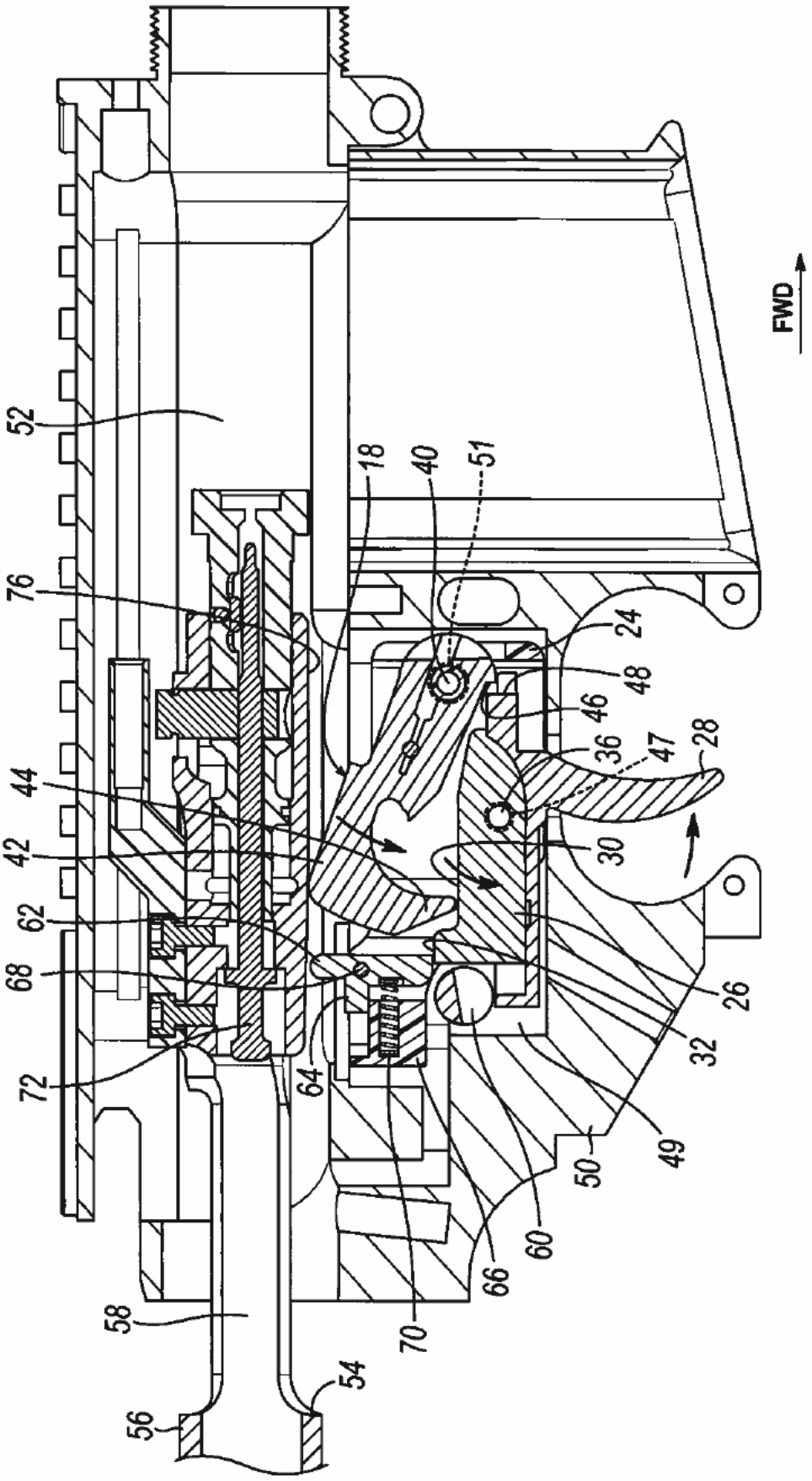

FWD
52
18
40
51
76
24
48
46
36
47
28
44
42
30
62
68
26
32
72
64
49
50
60
66
58
70
54
56

FIG. 5

Attachment L (7 of 10)

FIREARM TRIGGER MECHANISM

RELATED APPLICATIONS

This application claims priority to U.S. Provisional Patent Application No. 62/565,247 filed Sep. 29, 2017, and incorporates the same herein by reference.

TECHNICAL FIELD

This invention relates to a firearm trigger mechanism. More particularly, it relates to a semiautomatic trigger that is mechanically reset by movement of the hammer when it is reset by the bolt carrier.

BACKGROUND

In a standard semiautomatic firearm, actuation of the trigger releases a sear, allowing a hammer or striker to fire a chambered ammunition cartridge. Part of the ammunitions propellant force is used to cycle the action, extracting and ejecting a spent cartridge and replacing it with a loaded cartridge. The cycle includes longitudinal reciprocation of a bolt and/or carrier, which also resets the hammer or striker.

A standard semiautomatic trigger mechanism includes a disconnector, which holds the hammer or striker in a cocked position until the trigger member is reset to engage the sear. This allows the firearm to be fired only a single time when the trigger is pulled and held, because the user is not typically able to release the trigger rapidly enough so that the sear engages before the bolt or bolt carrier returns to its in-battery position. The disconnector prevents the firearm from either firing multiple rounds on a single pull of the trigger, or from allowing the hammer or striker to simply "follow" the bolt as it returns to battery without firing a second round, but leaving the hammer or striker uncocked.

For various reasons, shooters desire to increase the rate of semiautomatic fire. Sometimes this is simply for entertainment and the feeling of shooting a machine gun. In the past, users have been known to employ "bump firing" to achieve rapid semiautomatic fire. Bump firing uses the recoil of the semiautomatic firearm to fire shots in rapid succession. The process involves bracing the rifle with the non-trigger hand, loosening the grip of the trigger hand (but leaving the trigger finger in its normal position in front of the trigger), and pushing the rifle forward in order to apply pressure on the trigger from the finger while keeping the trigger finger stationary. When fired with the trigger finger held stationary, the firearm will recoil to the rear and allow the trigger to reset as it normally does. When the non-trigger hand pulls the firearm away from the body and back forward toward the original position, it causes the trigger to be pressed against the stationary finger again, firing another round as the trigger is pushed back.

Other devices have been offered that facilitate the bump fire process. One is shown in U.S. Pat. No. 6,101,918, issued Aug. 15, 2000, to William Akins for a Method and Apparatus for Accelerating the Cyclic Firing Rate of a Semiautomatic Firearm. This device, sold for some time as the Akins Accelerator™, allowed the receiver and action of the firearm to move longitudinally relative to the butt stock and used a spring to assist forward return movement. Other devices, such as that shown in U.S. Pat. No. 8,127,658, issued Mar. 6, 2012, and other patents owned by Slide Fire Solutions provide a replacement stock and handgrip assembly that facilitates bump firing, but without spring assistance.

Other solutions to increase the rate of semiautomatic fire include pull/release trigger mechanisms. These devices cause one round to be fired when the trigger is pulled and a second round to be fired when the trigger is released. Such a device is shown in U.S. Pat. No. 8,820,211, issued Sep. 2, 2014, entitled Selectable Dual Mode Trigger for Semiautomatic Firearms. A device like this is offered by FosTecH Outdoors, LLC as the ECHO TRIGGER™. Another device, offered by Digital Trigger Technologies, LLC under the name DigiTrigger™, provides a dual mode trigger in which the pull/release operating function is achieved electronically.

The above-described devices either require practice to use reliably, are complex, and/or are expensive to manufacture and install.

Another device for increasing the rate of semiautomatic fire is shown in U.S. Pat. Nos. 9,568,264; 9,816,772; and U.S. Pat. No. 9,939,221, issued to Thomas Allen Graves. The devices shown in these patents forcefully reset the trigger with rigid mechanical contact between the trigger member and the bolt as the action cycles. This invention, however, does not provide a "drop-in" solution for existing popular firearm platforms, like the AR15, AK47 variants, or the Ruger 10/22™. To adapt this invention to an AR-pattern firearm, for example, would require not only a modified fire control mechanism, but also a modified bolt carrier.

SUMMARY OF INVENTION

The present invention provides a semiautomatic trigger mechanism for increasing rate of fire that can be retrofitted into popular existing firearm platforms. In particular, this invention provides a trigger mechanism that can be used in AR-pattern firearms with an otherwise standard M16-pattern bolt carrier assembly. The present invention is particularly adaptable for construction as a "drop-in" replacement trigger module that only requires insertion of two assembly pins and the safety selector. In the disclosed embodiments, the normal resetting of the hammer, as the bolt or bolt carrier is cycled, causes the trigger to be forcibly reset by contact between the hammer and a surface of the trigger member. Once reset, movement of the trigger is blocked by a locking bar and cannot be pulled until the bolt has returned to battery, thus preventing "hammer follow" behind the bolt or bolt carrier.

Other aspects, features, benefits, and advantages of the present invention will become apparent to a person of skill in the art from the detailed description of various embodiments with reference to the accompanying drawing figures, all of which comprise part of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

Like reference numerals are used to indicate like parts throughout the various drawing figures; wherein;

FIG. **1** is an isometric view of a drop-in trigger module for an AR-pattern firearm according to one embodiment of the invention;

FIG. **2** is a partially cut-away view thereof;

FIG. **3** is a longitudinal section view showing the module of the embodiment installed in a typical AR15-pattern lower receiver in a cocked and ready to fire status with the bolt and bolt carrier in an in-battery position;

FIG. **4** is a similar view in which the trigger has been pulled and the hammer has fallen against a firing pin; and

FIG. **5** is a similar view showing the bolt carrier in a retracted position, forcing the hammer and trigger into a reset status.

DETAILED DESCRIPTION

With reference to the drawing figures, this section describes particular embodiments and their detailed construction and operation. Throughout the specification, reference to "one embodiment," "an embodiment," or "some embodiments" means that a particular described feature, structure, or characteristic may be included in at least one embodiment. Thus, appearances of the phrases "in one embodiment," "in an embodiment," or "in some embodiments" in various places throughout this specification are not necessarily all referring to the same embodiment. Furthermore, the described features, structures, and characteristics may be combined in any suitable manner in one or more embodiments. In view of the disclosure herein, those skilled in the art will recognize that the various embodiments can be practiced without one or more of the specific details or with other methods, components, materials, or the like. In some instances, well-known structures, materials, or operations are not shown or not described in detail to avoid obscuring aspects of the embodiments.

Referring first to FIGS. **1** and **2**, therein is shown at **10** a "drop-in" trigger module adapted for use in an AR-pattern firearm according to a first embodiment of the present invention. As used herein, "AR-pattern" firearm includes the semiautomatic versions of the AR10 and AR15 firearms and variants thereof of any caliber, including pistol caliber carbines or pistols using a blow-back bolt. While select fire (fully automatic capable) versions of this platform, such as the M16 and M4, are also AR-pattern firearms, this invention only relates to semiautomatic firearm actions. The concepts of this invention may be adaptable to other popular semiautomatics firearm platforms, such as the Ruger 10/22™ or AK-pattern variants.

The module **10** includes a frame or housing **12** that may be sized and shaped to fit within the internal fire control mechanism pocket of an AR-pattern lower receiver. It includes first and second pairs of aligned openings **14**, **16** that are located to receive transverse pins (**40**, **36**, respectively, shown in FIGS. **3-5**) used in a standard AR-pattern trigger mechanism as pivot axes for the hammer and trigger member, respectively. The housing **12** includes left and right sidewalls **20**, **22**, which extend substantially vertically and parallel to one another in a laterally spaced-apart relationship. The sidewalls **20**, **22** may be interconnected at the bottom of the housing **12** at the front by a crossmember **24**.

A hammer **18** of ordinary (MIL-SPEC) AR-pattern shape and construction may be used. The illustrated hammer **18** may be standard in all respects and biased by a typical AR-pattern hammer spring (not shown).

A modified trigger member **26** may be sized to fit between the sidewalls **20**, **22** of the housing **12** and may include a trigger blade portion **28** that extends downwardly. The trigger blade portion **28** is the part of the trigger member **26** contacted by a user's finger to actuate the trigger mechanism. The trigger blade portion **28** may be curved (shown) or straight, as desired. The trigger member **26** may pivot on a transverse pin **36** (not shown in FIGS. **1** and **2**) that extends through aligned openings **16** in the sidewalls **20**, **22** of the housing **12**. The same pin **36** is aligned and positioned within aligned openings **47** of a lower receiver **50** to assemble the module **10** into a fire control mechanism pocket **49** of the lower receiver **50**, as shown in FIGS. **3-5**, for example. The modified trigger member **26** may have integral first and second contact surfaces **30**, **32**. Some part of the trigger member **26** includes contact surfaces for interaction with the hammer **18** and locking bar **62**. For example, the trigger member **26** can include first and second upwardly extended rear contact surfaces **30**, **32**. The first contact surface **30** is positioned to interact, for example, with a tail portion **44** of the hammer **18** that extends rearwardly from a head part **42** of the hammer **18**. The second contact surface **32** is positioned to interact with a locking bar **62**. The contact surfaces may be integral to a specially formed trigger body or may be a separate insert (shown) that is made to closely fit and mate with a standard AR-pattern trigger member, held in place by the trigger pin **36**, with no lost motion between the parts.

The hammer **18** may include bosses **34** coaxial with a transverse pivot pin opening **38** that receives an assembly/pivot pin **40** (not shown in FIGS. **1** and **2**) through the first set of aligned openings **14** in the housing **12** (and through openings **51** in the firearm receiver, to position the trigger module **10** within the fire control mechanism pocket **49** of the lower receiver **50**, as shown in FIGS. **3-5**). The bosses **34** may fit between the sidewalls **20**, **22** of the housing **12** to laterally position the hammer **18**, or can be received in the openings **14** (if enlarged) so that the hammer **18** stays assembled with the module **10** when the hammer's pivot pin is removed and/or when the module **10** is not installed in a firearm receiver. The hammer **18** includes a head portion **42** and a tail portion **44**. The hammer **18** also includes a sear catch **46** that engages the sear **48** on the trigger member **26**, when cocked. The trigger and hammer pins **36**, **40** provide pivot axes at locations (openings **47**, **51**, shown in FIGS. **3-5**, for example) standard for an AR-pattern fire control mechanism. Although FIGS. **3-5** are a longitudinal section view and only show one of the aligned openings **47**, **51**, it is understood that a typical AR15-pattern lower receiver **50** includes second, corresponding and aligned openings **47**, **51** in the half of the receiver **50** not shown).

Referring now also to FIG. **3**, the trigger module **10** is shown installed in the fire control mechanism pocket **49** of an AR-pattern lower receiver **50**. Other lower receiver parts not important to the present invention are well-known in the art and are omitted from all figures for clarity. As is well-known in the art, the bolt carrier assembly **52** (or blow-back bolt) would be carried by an upper receiver (not shown) and engage the breach of a barrel or barrel extension. As used herein, "bolt carrier" and "bolt carrier assembly" may be used interchangeably and include a blow-back type bolt used in pistol caliber carbine configurations of the AR-platform. The hammer **18** is shown in a cocked position and a bolt carrier assembly **52** is shown in an in-battery position. The sear **48** engages the sear catch **46** of the hammer **18**.

The bolt carrier assembly **52** used with the embodiments of this invention can be an ordinary (mil-spec) M16-pattern bolt carrier assembly, whether operated by direct impingement or a gas piston system, that has a bottom cut position to engage an auto sear in a fully automatic configuration. The bottom cut creates an engagement surface **54** in a tail portion **56** of the bolt carrier body **58**. This is distinct from a modified AR15 bolt carrier that is further cut-away so that engagement with an auto sear is impossible. The semiautomatic AR-pattern safety selector switch **60** may also be standard (MIL-SPEC) in all respects.

The trigger module of the present invention includes a trigger locking bar **62** carried on a frame **66** for pivotal movement on a transverse pivot pin **68**. The frame **66** may be part of the module housing **12**, if configured as a "drop-in" unit. An upper end of the locking bar **62** extends above the upper edge of the housing **12** and lower receiver **50** to be engaged by the engagement surface **54** of the bolt

Attachment I-1 pg 29

carrier body **58** when the bolt carrier assembly **52** is at or near its in-battery position (as shown in FIG. **3**). Contact between the engagement surface **54** and upper end of the locking bar **62** causes the locking bar **62** to pivot into a first position (FIG. **3**) against a biasing spring **70** and allows pivotal movement of the trigger member **26**. If desired, the locking bar **62** may include a rearward extension **64** that serves as a means to limit the extent to which it can pivot toward the blocking position.

Referring now also to FIG. **4**, when the safety selector **60** is in the "fire" position (as shown in all figures), finger pressure pulling rearward against the trigger blade portion **28** causes the trigger member **26** to rotate on the pivot pin **36**, as indicated by arrows. This rotation causes the sear **48** to disengage from the sear catch **46** of the hammer **18**. This release allows the hammer **18** to rotate by spring force (hammer spring omitted for clarity) into contact with the firing pin **72**. Any contact between the rear portion of the trigger member **26** and front surface of the locking bar **62** will simply cause the locking bar **62** to rotate out of the way, as illustrated in FIG. **4**.

Referring now to FIG. **5**, discharging an ammunition cartridge (not shown) causes the action to cycle by moving the bolt carrier assembly **52** rearwardly, as illustrated. The same effect occurs when the action is cycled manually. As in an ordinary AR15-pattern configuration, a lower surface **76** of the bolt carrier body **58** pushes rearwardly against the head portion **42** of the hammer **18**, forcing it to pivot on the hammer pivot/assembly pin **40** against its spring (not shown) toward a reset position. As the rearward movement of the bolt carrier body **58** and pivotal movement of the hammer **18** continues, mechanical interference or contact between a rear surface **74** of the hammer **18** (such as on the tail portion **44**) and a contact surface **30** of the trigger member **26** forces the trigger to pivot (arrows in FIG. **5**) toward and to its reset position. At the same time, as the trigger member **26** is reset, the biasing spring **70** moves the lower end of the locking bar **62** into a second position (FIG. **5**) in which it blocks pivotal movement of the trigger **26**, including by finger pressure applied (or reapplied) to the trigger blade **28**. Thus, as the bolt carrier assembly **52** returns forward, the trigger member **26** is held in its reset position by the locking bar **62** where the hammer sear catch **46** will engage with the sear **48** carried on the trigger member **26** to reset the fire control mechanism. The trigger member **26** cannot be pulled to release the sear/hammer engagement, thus precluding early hammer release or "hammer follow" against the bolt carrier assembly **52** and firing pin **72** as the bolt carrier assembly **52** is returning to battery. A trigger return spring (not shown) of the type used in a standard AR-pattern trigger mechanism may be unnecessary in this case, because the trigger member **26** is forced to return by the hammer **18**, but may be used, if desired.

When the bolt carrier assembly **52** has reached (or nearly reached) its closed, in-battery position (shown in FIG. **3**), the engagement surface **54** of the bolt carrier tail portion **56** contacts and forwardly displaces the upper end of the locking bar **62**, disengaging the second contact surface **32** of the trigger member **26**, allowing the trigger **26** to be pulled a second time. The distance of travel during which there is no interference between the locking bar **62** and second contact surface **32** of the trigger member **26**, allowing the trigger member **26** to be manually displaced, may be about from about 0.10 to 0.31 inch. This prevents early release of the hammer **18** and contact of the hammer against the firing pin **72** before the bolt is completely locked and in-battery.

Force applied by the user's trigger finger against the trigger blade portion **28** is incapable of overcoming the mechanical interference and force of the hammer **18** against the contact surface **30** of the trigger member **26**. However, the trigger can immediately be pulled again—only by application of an external force—as soon as the locking bar **62** has been rotated against the spring **70** and out of blocking engagement with the trigger member **26**, as the bolt carrier assembly **52** approaches or reaches its in-battery position. This allows the highest possible standard rate of fire, without risk of hammer-follow, for the semiautomatic action of the firearm.

While various embodiments of the present invention have been described in detail, it should be apparent that modifications and variations thereto are possible, all of which fall within the true spirit and scope of the invention. Therefore, the foregoing is intended only to be illustrative of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not intended to limit the invention to the exact construction and operation shown and described. Accordingly, all suitable modifications and equivalents may be included and considered to fall within the scope of the invention, defined by the following claim or claims.

What is claimed is:

1. For a firearm having a receiver with a fire control mechanism pocket, transversely aligned pairs of hammer and trigger pin openings in side walls of the pocket, and a bolt carrier that reciprocates and pivotally displaces a hammer when cycled, a trigger mechanism, comprising:

a hammer having a sear notch and mounted in the fire control mechanism pocket to pivot on a transverse hammer pin between set and released positions;

a trigger member having a sear and mounted in the fire control mechanism pocket to pivot on a transverse trigger pin between set and released positions, the trigger member having a surface positioned to be contacted by the hammer when the hammer is displaced by cycling of the bolt carrier, the contact causing the trigger member to be forced to the set position;

a locking bar pivotally mounted in a frame and spring biased toward a first position in which the locking bar mechanically blocks the trigger member from moving to the released position, and movable against the spring bias to a second position when contacted by the bolt carrier reaching a substantially in-battery position, allowing the trigger member to be moved by an external force to the released position.

2. The trigger mechanism of claim **1**, wherein the trigger member has a second surface positioned to be contacted by the locking bar when the locking bar is in the first position.

3. The trigger mechanism of claim **1**, wherein the locking bar includes means for limiting the extent to which the locking bar can pivot by the spring bias toward the first position.

4. For a firearm having a receiver with a fire control mechanism pocket, assembly pin openings in side walls of the pocket, and a bolt carrier that reciprocates and pivotally displaces a hammer when cycled, a trigger mechanism, comprising:

a housing having transversely aligned pairs of openings for receiving hammer and trigger assembly pins;

a hammer having a sear notch and mounted in the housing to pivot on a transverse axis between set and released positions;

a trigger member having a sear and mounted in the housing to pivot on a transverse axis between set and

released positions, the trigger member having a surface positioned to be contacted by the hammer when the hammer is displaced by the bolt carrier when cycled, the contact causing the trigger member to be forced to the set position;

a locking bar pivotally mounted in the housing and spring biased toward a first position in which the locking bar mechanically blocks the trigger member from moving to the released position, and movable against the spring bias to a second position when contacted by the bolt carrier reaching a substantially in-battery position in which the trigger member can be moved by an external force to the released position.

5. The trigger mechanism of claim **4**, wherein the trigger member has a second surface positioned to be contacted by the locking bar when the locking bar is in the first position.

6. The trigger mechanism of claim **4**, wherein the housing's transversely aligned pairs of openings for receiving hammer and trigger assembly pins are aligned with the assembly pin openings in the fire control mechanism pocket of the receiver.

7. The trigger mechanism of claim **4**, wherein the locking bar includes means for limiting the extent to which the locking bar can pivot by the spring bias toward the first position.

* * * * *

Attachment J (1 of 2)

UNITED STATES
PATENT AND TRADEMARK OFFICE

Patent assignment 052893/0732

ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

Date recorded	Reel/frame	Pages
Jun 10, 2020	052893/0732	2

Assignors	Execution date
WOLF TACTICAL, LLC	May 7, 2020

Assignee
RARE BREED TRIGGERS, LLC
733 WEST COLONIAL DRIVE
ORLANDO, FLORIDA 32804

Correspondent
JEFFREY COOPER ROUNDS
[redacted]
BUDA, TX 78610

Properties (1 total)

Patent	Publication	Application	PCT	International registration
1. FIREARM TRIGGER MECHANISM Inventors: JEFFREY COOPER ROUNDS				PatFT
10514223 Dec 24, 2019		16143624 Sep 27, 2018		

UNITED STATES
PATENT AND TRADEMARK OFFICE

Patent assignment 046989/0991

ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

Date recorded	Reel/frame	Pages
Sep 27, 2018	046989/0991	3

Assignors
ROUNDS, JEFFREY COOPER

Execution date
Sep 26, 2018

Assignee
WOLF TACTICAL LLC
1955 FM 2001 #600
BUDA, TEXAS 78610

Correspondent
WOOD, HERRON & EVANS, LLP
2700 CAREW TOWER
441 VINE STREET
CINCINNATI, OH 45202

Properties (1 total)

Patent	Publication	Application	PCT	International registration
1. FIREARM TRIGGER MECHANISM Inventors: JEFFREY COOPER ROUNDS				PatFT
10514223 Dec 24, 2019		16143624 Sep 27, 2018		

.S. Department of Justice
Bureau of Alcohol, Tobacco, Firearms and Explosives

Firearms Technology Criminal Branch
Report of Technical Examination

244 Needy Road #1600
Martinsburg, WV 25405

Phone: 304-616-4300
Fax: 304-616-4301

To:
Special Agent Michael T. Nuttall
Bureau of Alcohol, Tobacco, Firearms and Explosives
99 New York Avenue NE
MS: 90K-250
Washington, DC 20026

Date:

UI#: 163080-21-0006

RE: Rarebreed Firearms
FRT-15

FTCB#: 2021-595-DAS
317066

Date Exhibit Received: 06/04/2021

Delivered By: FedEx# 7738 9219 6853

Type of Examination Requested:

Examination, Test, Classification

Exhibit:

1. Rare Breed Triggers, model FRT-15, no serial number (suspected machinegun).

Pertinent Authority:

Title 28 of the United States Code (U.S.C.) provides the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF) the authority to investigate criminal and regulatory violations of Federal firearms law at the direction of the Attorney General. Under the corresponding Federal regulation at 28 CFR. 0.130 the Attorney General provides ATF with the authority to investigate, administer, and enforce the laws related to firearms, in relevant part, under 18 U.S.C. Chapter 44 (Gun Control Act) and 26 U.S.C. Chapter 53 (National Firearms Act). Pursuant to the aforementioned statutory and regulatory authority, the ATF Firearms Ammunition and Technology Division (FATD) provides expert technical support on firearms and ammunition to federal, state, and local law enforcement agencies regarding the Gun Control Act and National Firearms Act.

The amended Gun Control Act of 1968 (GCA), defines the term "**machinegun**" has "*the meaning given such term in section 5845(b) of the National Firearms Act (26 U.S.C. 5845(b))*." (See 18 U.S.C. § 921(a)(23).)

The National Firearms Act of 1934 (NFA) **Identification of firearms other than destructive devices**. "*Each manufacturer and importer and anyone making a firearm shall identify each firearm, other than a destructive device, manufactured, imported, or made by a serial number which may not be readily removed, obliterated, or altered, the name of the manufacturer, importer, or maker, and such other identification as the Secretary may by regulations prescribe.*" (See 26 U.S.C. § 5842(a).)

The NFA, defines "**firearm**" to mean, in part: "*...(6) a machinegun....*" (See 26 U.S.C. § 5845(a).)

The NFA, defines the term "**machinegun**" as follows: "*...any weapon which shoots, is designed to shoot, or can be readily restored to shoot, automatically more than one shot, without manual reloading, by a single function of the trigger. The term shall also include the frame or receiver of any such weapon, any part designed and intended solely and exclusively, or combination of parts designed and intended, for use in converting a weapon into a machinegun, and any combination of parts from which a machinegun can be assembled if such parts are in the possession or under the control of a person.*" (See 26 U.S.C. § 5845(b).)

27 CFR § 479.11 defines the term "**machinegun**" and includes, in part: "*...For purposes of this definition, the term "automatically" as it modifies "shoots, is designed to shoot, or can be readily restored to shoot," means functioning as the result of a self-acting or self-regulating mechanism that allows the firing of multiple rounds through a single function of the trigger; and "single function of the trigger" means a single pull of the trigger and analogous motions. The term "machinegun" includes a bump-stock-type device, i.e., a device that allows a semi-automatic firearm to shoot more than one shot with a single pull of the trigger by harnessing the recoil energy of the semiautomatic firearm to which it is affixed so that the trigger resets and continues firing without additional physical manipulation of the trigger by the shooter.*" (See 27 CFR § 479.11.)

Findings:

Note: FTISB previously examine a similar "forced reset trigger" from [redacted] *(holder of U.S. Patent 10514223) and determined it to be a combination of parts, designed and intended for use in converting a weapon into a machinegun; and therefore, a "**machinegun**" as defined in the GCA and NFA (see FTISB letter 307385, dated August 28, 2018 attached).*

Exhibit 1 is a Rare Breed Triggers, model FRT-15, AR15-type drop-in fire-control group, manufactured by Rare Breed Triggers in Orlando, Florida. I observed that the Exhibit has no serial number in accordance with 26 U.S.C. § 5842.

I examined Exhibit 1 and found it to be an AR15-type drop-in fire-control group with the following features and characteristics:

- ¼ inch wide hammer, trigger, and locking bar
- Aluminum housing
- Two (2) tubular pins
- One (1) solid pin
- Three (3) springs
- Two (2) pins with interior threads at both ends
- Four (4) hex head screws with exterior threads

During my examination, I observed the following markings on Exhibit 1:

Aluminum housing (right side): **RARE BREED**
-TRIGGERS-
US PAT. 10514223

Findings (Cont.):

Exhibit 1 is identifiable from U.S. Patent #10,514,223 B1 and functions on the same mechanical principle as U.S. Patent #10,254,067 B2.

U.S. Patent #10,514,223 B1 specifically states that this is a device which *"causes the trigger to be forcibly reset," and "once reset, movement of the trigger is blocked by a locking bar and cannot be pulled until the bolt has returned to battery, thus preventing "hammer follow" behind the bolt or bolt carrier."* My examination determined Exhibit 1 does not function by "hammer follow."

As explanation, FATD has also evaluated devices which prevented the trigger from positively resetting and resulted in a "hammer-follow" scenario. A device designed to prevent the hammer from positively resetting could cause a firearm to shoot automatically more than one shot, without manual reloading, by a single function of the trigger, and would also be classified as a combination of parts designed and intended, for use in converting a weapon into a machinegun; thus a "**machinegun**" as defined in 26 U.S.C. § 5845(b).

However, the incorporation of a positive disconnecting or trigger resetting feature alone, does not preclude or remove such a weapon or device from the definition of a "**machinegun**" as defined in the NFA, 26 U.S.C. § 5845(b). Although the presence of hammer follow may require classification of a firearm as a machinegun, this is just one way in which a firearm may satisfy the "machinegun" definition. Therefore, the mere absence of "hammer-follow" in an AR-type firearm does not exclude such a firearm from being classified as a machinegun. Machinegun classifications are based on the examination of the device and whether the device converts a weapon to shoot automatically.

Federal regulation, 27 CFR § 479.11, states that the term "automatically" as it modifies "shoots, is designed to shoot, or can be readily restored to shoot," means functioning as the result of a self-acting or self-regulating mechanism that allows the firing of multiple rounds through a single function of the trigger. Indeed, Federal courts have long held that automatically means that the weapon "fires repeatedly with a single pull of the trigger." *Staples v. United States*, 511 U.S. 600, 602 n. 1 (1994). "That is, once its trigger is depressed, the weapon will automatically continue to fire until its trigger is released or the ammunition is exhausted." Id.

Further, Federal regulation 27 CFR § 479.11, states that "single function of the trigger" means a single pull of the trigger and analogous motions. Courts have specifically affirmed ATF's interpretation that a single act of the shooter to initiate the firing sequence is a single function of the trigger. *Atkins v. United States*, 312 F. App'x 197, 200 (11th Cir. 2009); *Freedom Ordnance Mfg., Inc. v. Brandon*, 2018 U.S. Dist. LEXIS 243000 (S.D. Ind. Mar. 27, 2018) . *United States v. Fleischli*, 305 F.3d 643, 655 (7th Cir. 2002)(in which electronic switch was the trigger when it served to initiate the firing sequence and the minigun continued to fire until the switch was turned off or the ammunition was exhausted). In *Freedom Ordnance* case, the United States District Court of Indiana confirmed that ATF was not arbitrary and capricious in the classification of an "electronic reset assist device" as a machinegun even though the firearm's trigger reset before each shot by pushing the shooter's finger forward. *Freedom Ordnance Mfg., Inc,* No. 3:16-cv-00243-RLY-MPB. In these cases, a firearm is a machinegun when an internal mechanism or operation automatically forces the individual's finger forward instead of requiring that the shooter release the trigger.

Findings (Cont.):

If a device is designed to assist in preventing the hammer from positively resetting or which utilizes ***a spring, electric motor or non-manual source of energy which assists in the automatic resetting of the hammer and causes a firearm to shoot automatically more than one shot, without manual reloading, by a single function of the trigger***, such an item or device would be classified as a combination of parts designed and intended, for use in converting a weapon into a machinegun; thus a "machinegun" as defined in 26 U.S.C. § 5845(b).

Below is a description of how the Rare Breed Trigger, FRT-15 device operates with attached diagrams found on the Rare Breed Trigger website.

First, the FRT-15 device must be installed into an AR15-type weapon which includes a H3 weight buffer and M16-type bolt carrier. These components are necessary because the specific design of the FRT-15 requires these to function as designed.

The picture on page 4 of the attached, shows the position of the hammer (orange), trigger (red), and locking bar (green) in the FRT-15 device once the weapon is charged and the selector is placed in the fire position. In this configuration, the hammer is held in place with its sear surface against the front of the trigger.

When the trigger is pulled (rearward pressure applied to the trigger), the hammer is released and strikes the firing pin, igniting the cartridge primer, and starting the cycle of operations (See attachment page 5 picture 7).

As the bolt carrier moves to the rear, the hammer is driven into the top of the trigger forcing it forward. The bolt carrier then strikes the locking bar moving, it to lock the trigger in the forward position (See attachment page 6 picture 8).

As the bolt carrier moves forward, the trigger is held in the forward position by the locking bar and the hammer engages the sear surface on the front of the trigger (See attachment page 7 picture 9).

As the bolt carrier continues to move forward, it strikes the rear surface of the locking bar releasing the trigger. If the shooter maintains constant rearward pressure to the trigger, that single constant pull will continue the cycle of operation and fire a subsequent projectile. (See attachment page 8, 9 picture 10, 11). This differs from a cycle of oeprations in a typical AR-type semiautomatic firearm in which a shooter must release and pull the trigger to fire a second projecile. As stated, a firearm assembled with the FRT-15 requires no such release and subsequent pull by the shooter to fire a second projectile. Instead, the shooter may fire a second projectile merely by maintaining the initial trigger pull and allowing the self-acting internal mechanism to complete its automatic cycle of operation.

To confirm this, I assembled an AR15-type firearm from the National Firearms Collection (NFC) using a Bushmaster AR15-type receiver, H3 buffer, M16-type upper assembly, and the FRT-15 device (See attachment pages 10, 11 pictures 12, 13, 14, 15).

I test-fired Exhibit 1 on June 7, 2021, at the ATF test range, Martinsburg, West Virginia, using commercially available, Federal brand, 5.56x45mm caliber ammunition and a magazine from the NFC.

Findings (Cont.):

First, I inserted a one-round ammunition load, charged the weapon, and with the selector in the "FIRE" position, pulled the trigger. The NFC weapon, with Exhibit 1 installed, successfully expelled a single projectile by the action of an explosive. I repeated this method of test-fire one additional time, obtaining the same result.

Next, I inserted a two-round ammunition load, charged the weapon, and with the selector in the "FIRE" position pulled the trigger and held it to the rear, the NFC weapon, with Exhibit 1 installed, fired two (2) rounds automatically by a single pull/function of the trigger. I repeated this method of test-fire one additional time, obtaining the same result.

Finnaly, I inserted a five-round ammunition load, charged the weapon, and with the selector in the "FIRE" position, pulled the trigger and held it to the rear, the NFC weapon, with Exhibit 1 installed, fired five (5) rounds automatically by a single pull/function of the trigger. I repeated this method of test-fire one additional time, obtaining the same result.

The FRT-15 device incorporates parts that are novel to the operation of a typical AR-type semiautomatic firearm. These unique parts (hammer, trigger and locking bar) within the FRT-15 trigger mechanism are specifically designed to incorporate the standard rearward and forward movement of the AR-type bolt carrier in its cycle of operations allowing the weapon to function as a self-acting, or self-regulating, mechanism. Whereas in a typical AR-type firearm, the rearward movement of the bolt carrier extracts, then ejects a cartridge case, and cocks the hammer. However, in the FRT-15, the rearward movement is also utilized to eliminate the necessity for the shooter to release their pull of the trigger. In a typical AR-type firearm, the forward movement of the bolt carrier loads a subsequent cartridge, and locks the bolt, while the FRT-15 also utilizes this forward movement to automatically release the trigger and hammer, allowing the weapon to expel a second projectile without a separate pull of the trigger. In this way, one continuous pull of the trigger allows a semiautomatic firearm to shoot more than one shot. This mechanical action and principle is explained in U.S. Pat. #10,514,223 and U.S. Patent # 10,254,067 B2, and demonstrated in the test-fires above.

As received, Exhibit 1 is a combination of parts, designed and intended for use in converting a weapon (AR15-type) into a machinegun; therefore, it is a "**machinegun**" as defined in the GCA and NFA.

Conclusions:

Exhibit 1 is a combination of parts, designed and intended for use in converting a weapon into a machinegun; therefore, it is a "**machinegun**" as defined in 26 U.S.C. § 5845(b).

Exhibit 1 is a "**machinegun**" as defined in 18 U.S.C. § 921(a)(23).

Exhibit 1, being a machinegun, is also a "**firearm**" as defined in 26 U.S.C. § 5845(a)(6).

Exhibit 1 is not marked in accordance with 26 U.S.C. § 5842(a).

Examined By:

David A. Smith1
Digitally signed by David A. Smith1
Date: 2021.07.15 15:43:05 -04'00'

David A. Smith
Firearms Enforcement Officer

Approved By:

GREGORY STIMMEL
Digitally signed by GREGORY STIMMEL
Date: 2021.07.15 15:50:02 -04'00'

Gregory Stimmel, Chief
Firearms Technology Criminal Branch

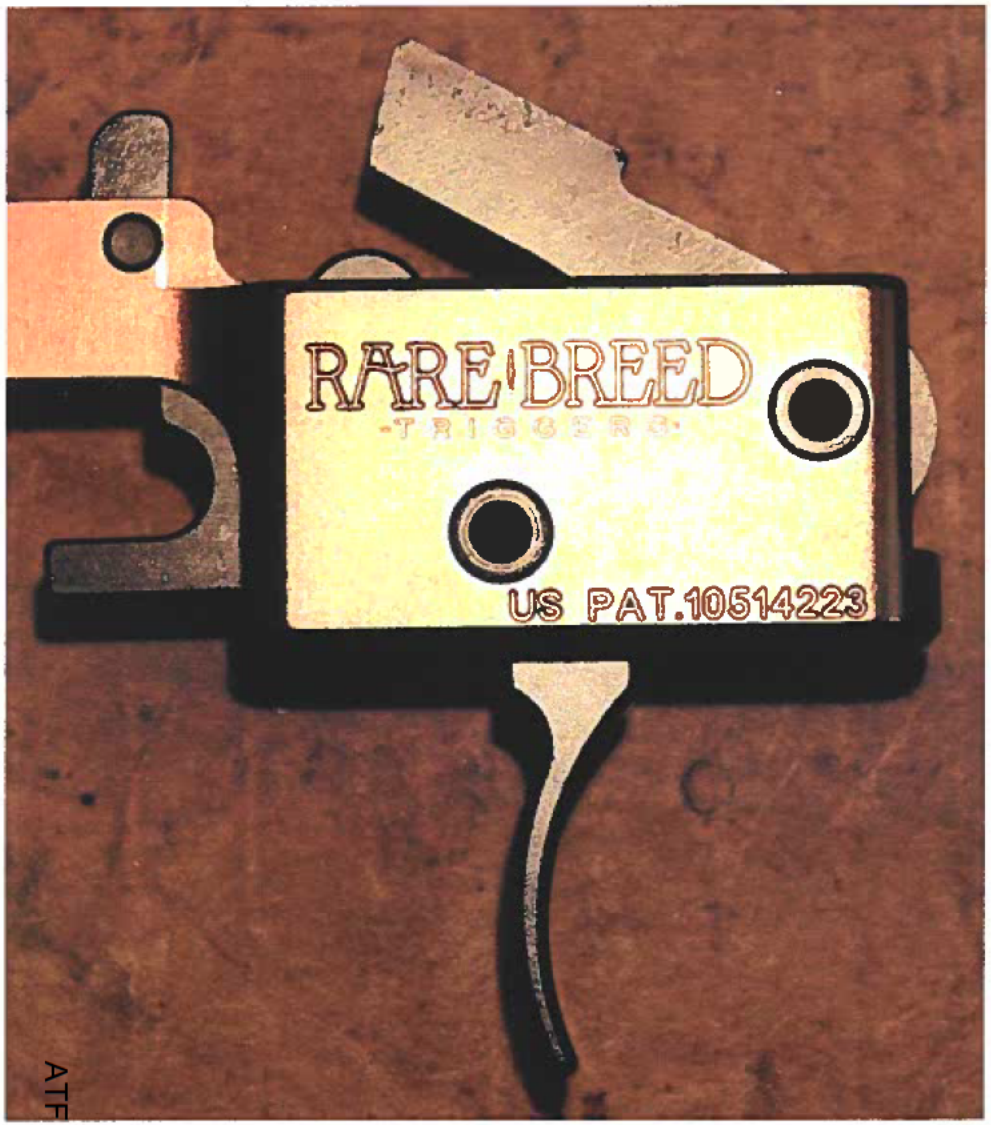
Attachment: 11 pages bearing a total of 15 photographs, U.S. Patents #10,254,067 B2; 10,514,223 B1, and ATF letter # 307385.

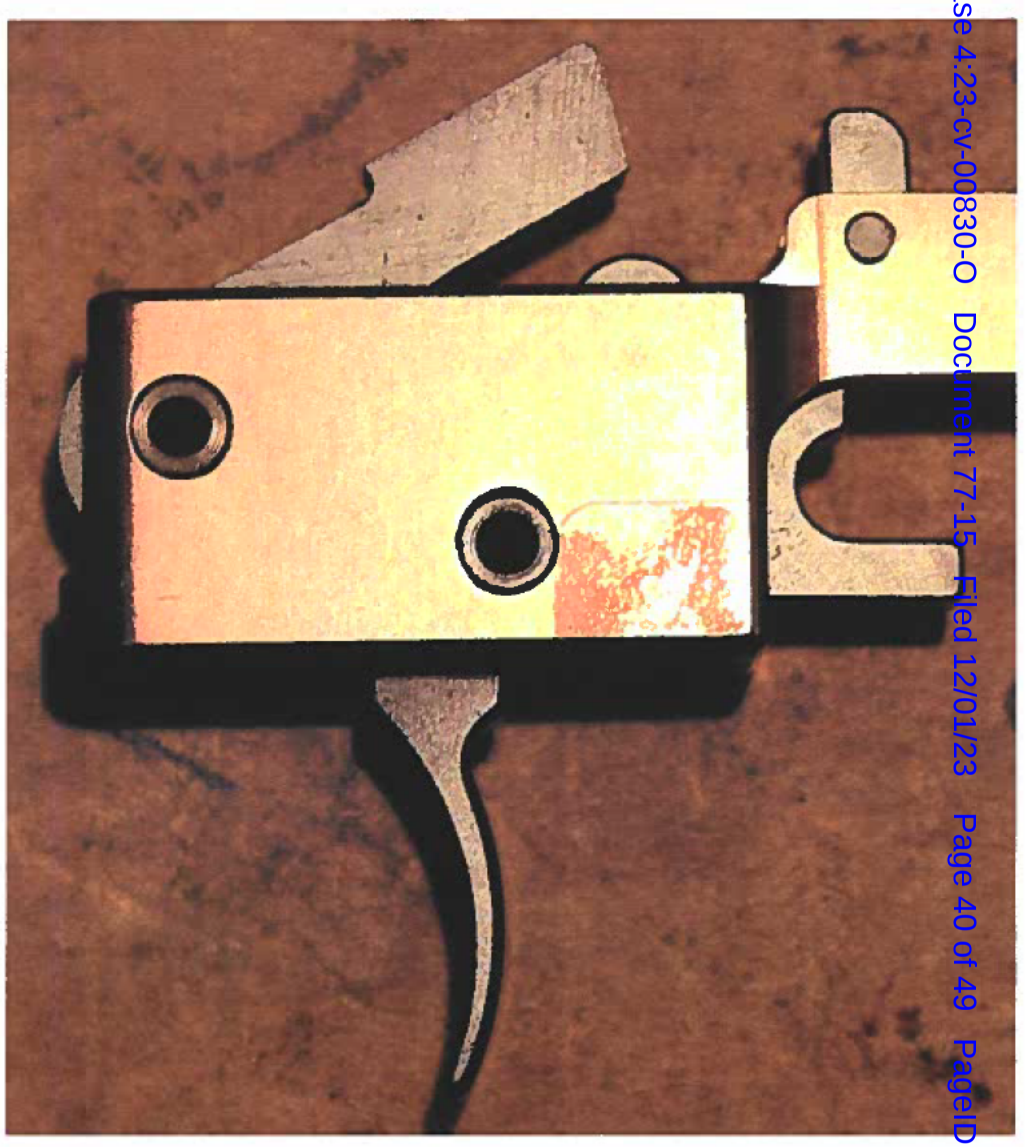
Enclosed is a Firearms Technology Criminal Branch report provided in response to your request for assistance. Please be aware that these documents constitute "taxpayer return information" that is subject to the strict disclosure limitations provided in 26 U.S.C. § 6103. Exceptions to the non-disclosure provisions that permit the disclosure internally within ATF are set forth in 26 U.S.C. §§ 6103(h)(2)(C) and (o)(1). Any further disclosure of these reports is strictly limited and must be reviewed and approved by the Office of Chief Counsel prior to any information dissemination. Failure to adhere to the disclosure limitations provided in 26 U.S.C. § 6103 could result in civil and/or criminal liability.

ATF 0945

6 - Exhibit 1 – Picture 3, 4

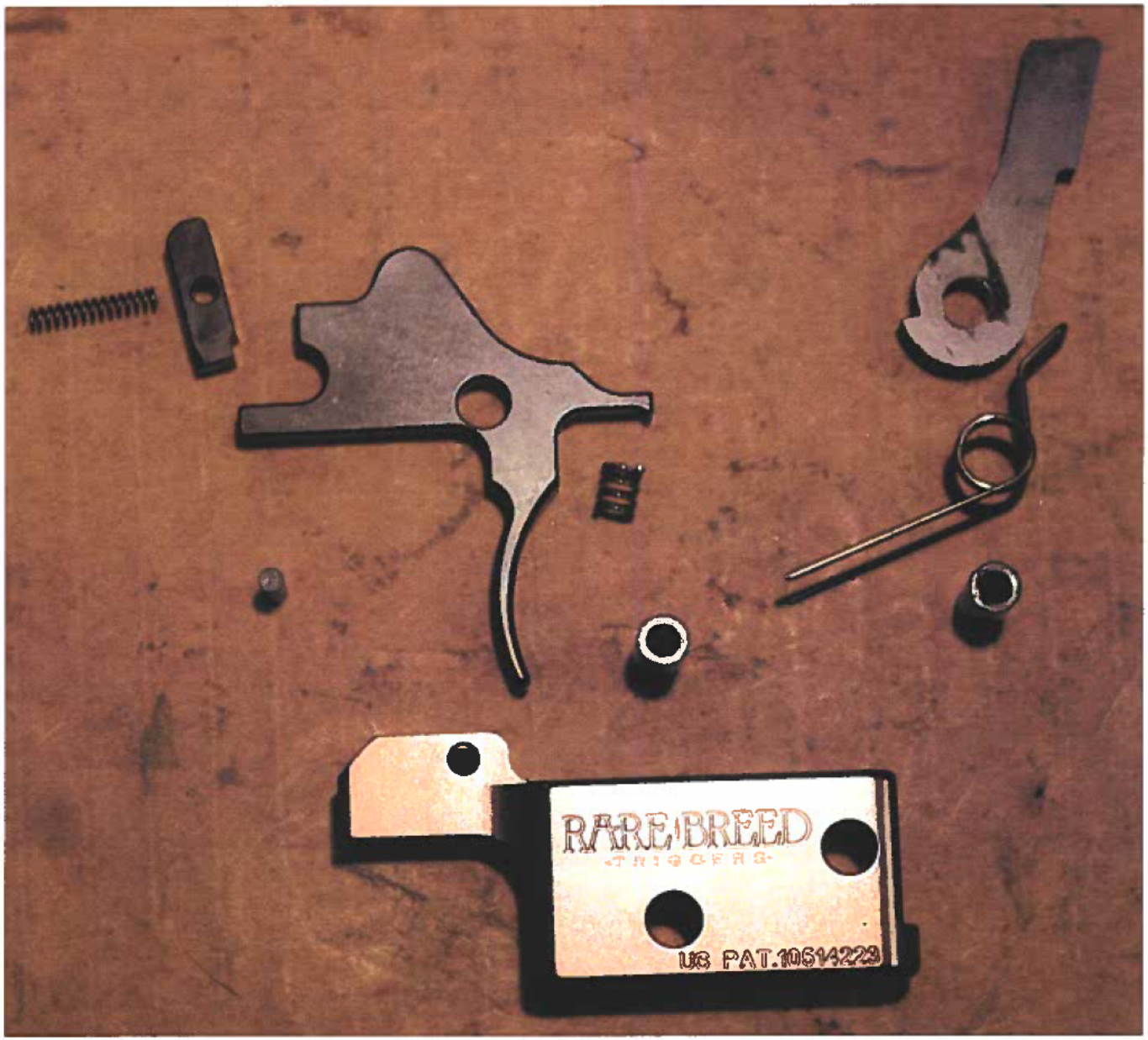
2021-595-I





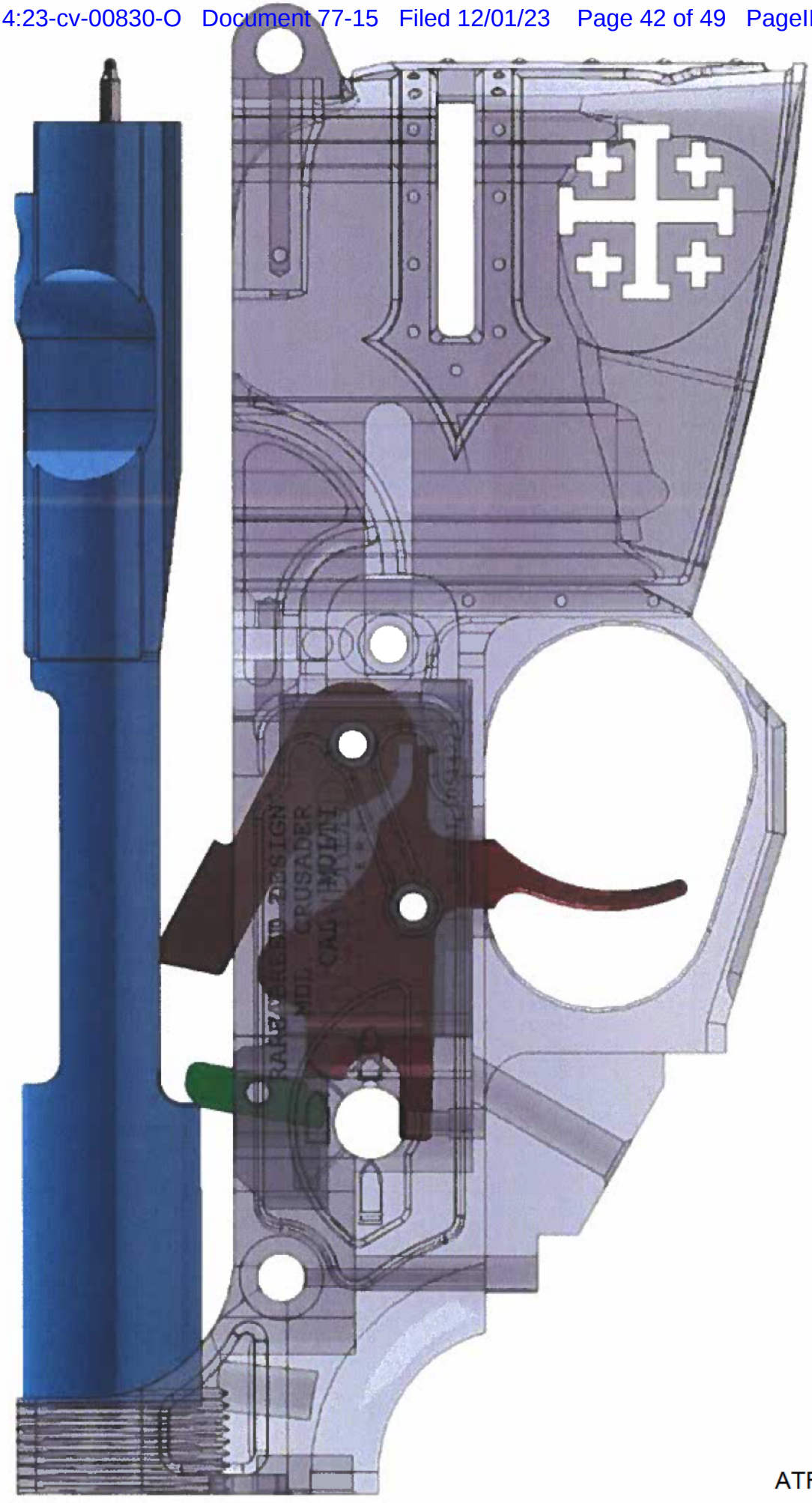
6 - Exhibit 1 – Picture 5

2021-595-I



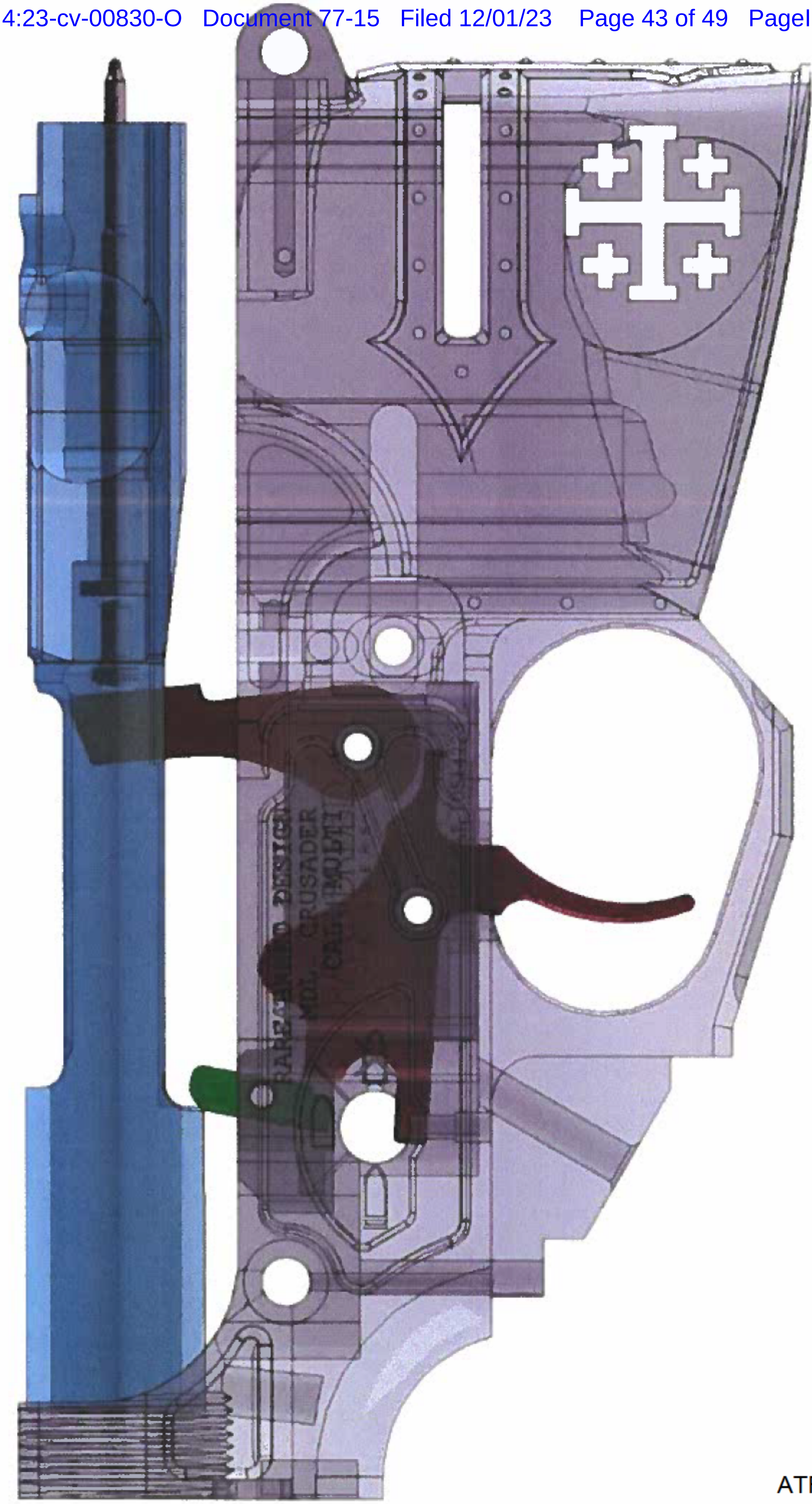
ATF 0947

2021-595-

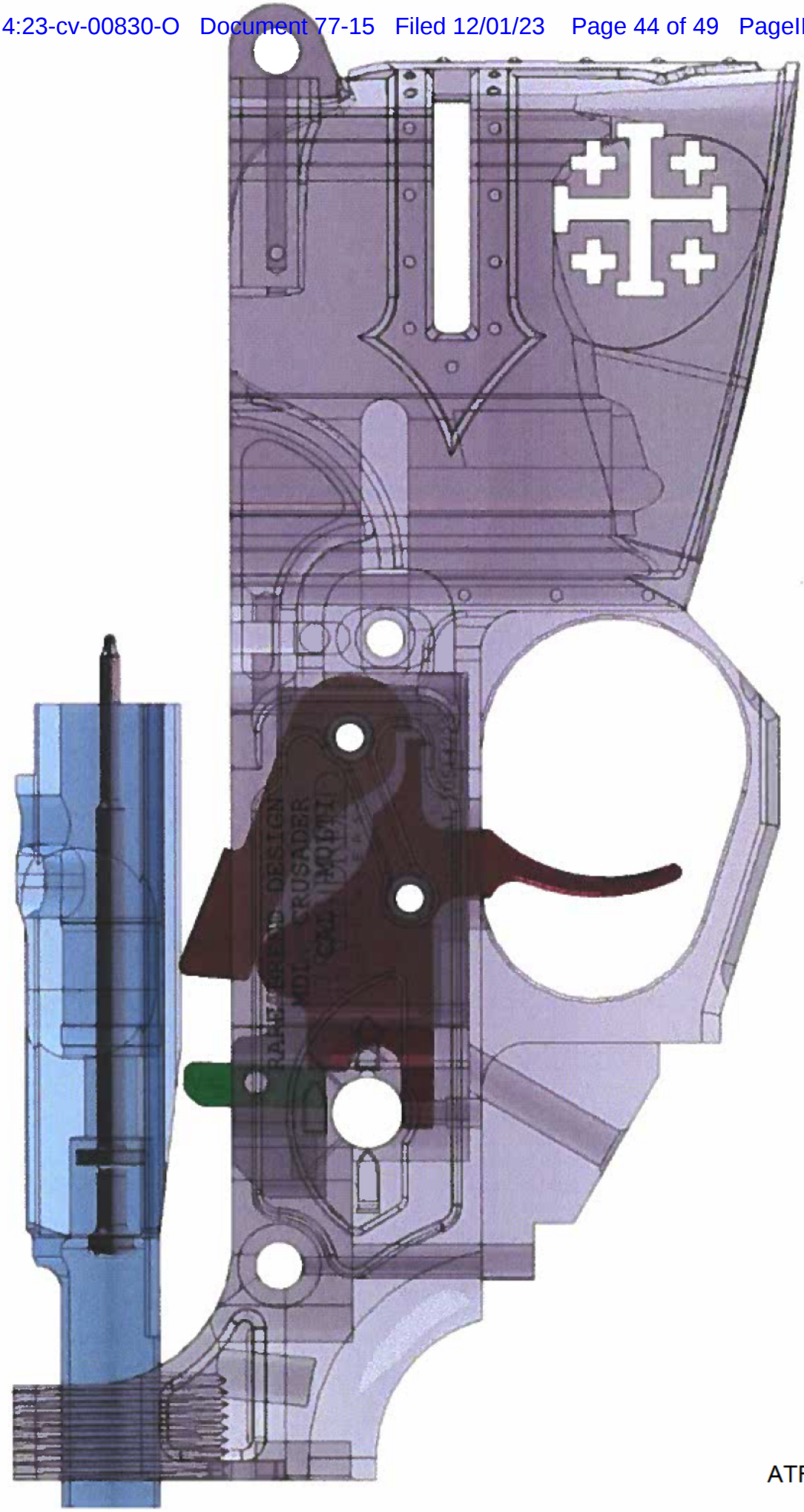


6 - Exhibit 1 – Picture 6

6 - Exhibit 1 – Picture 7 2021-595-I

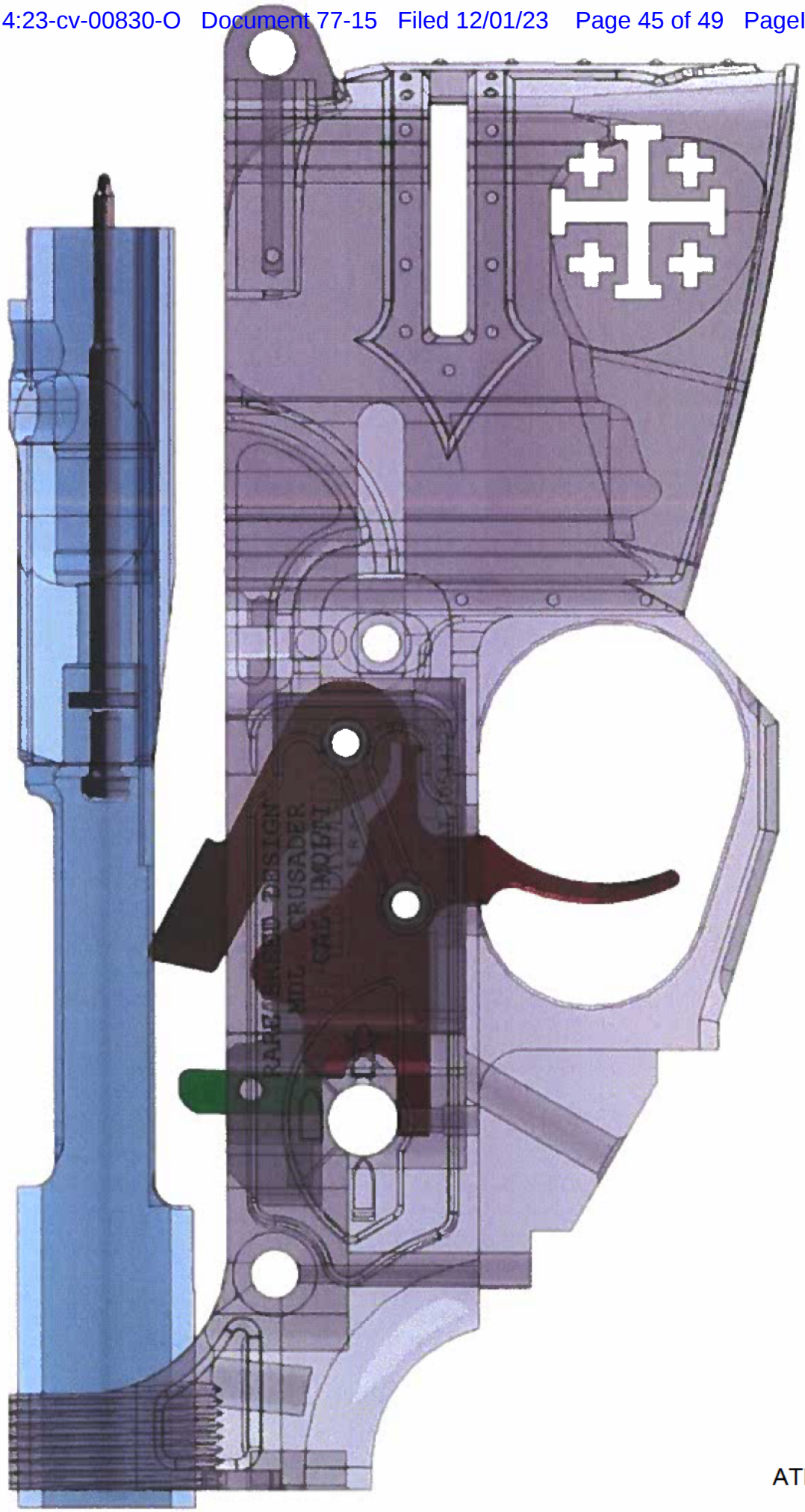


2021-595-I



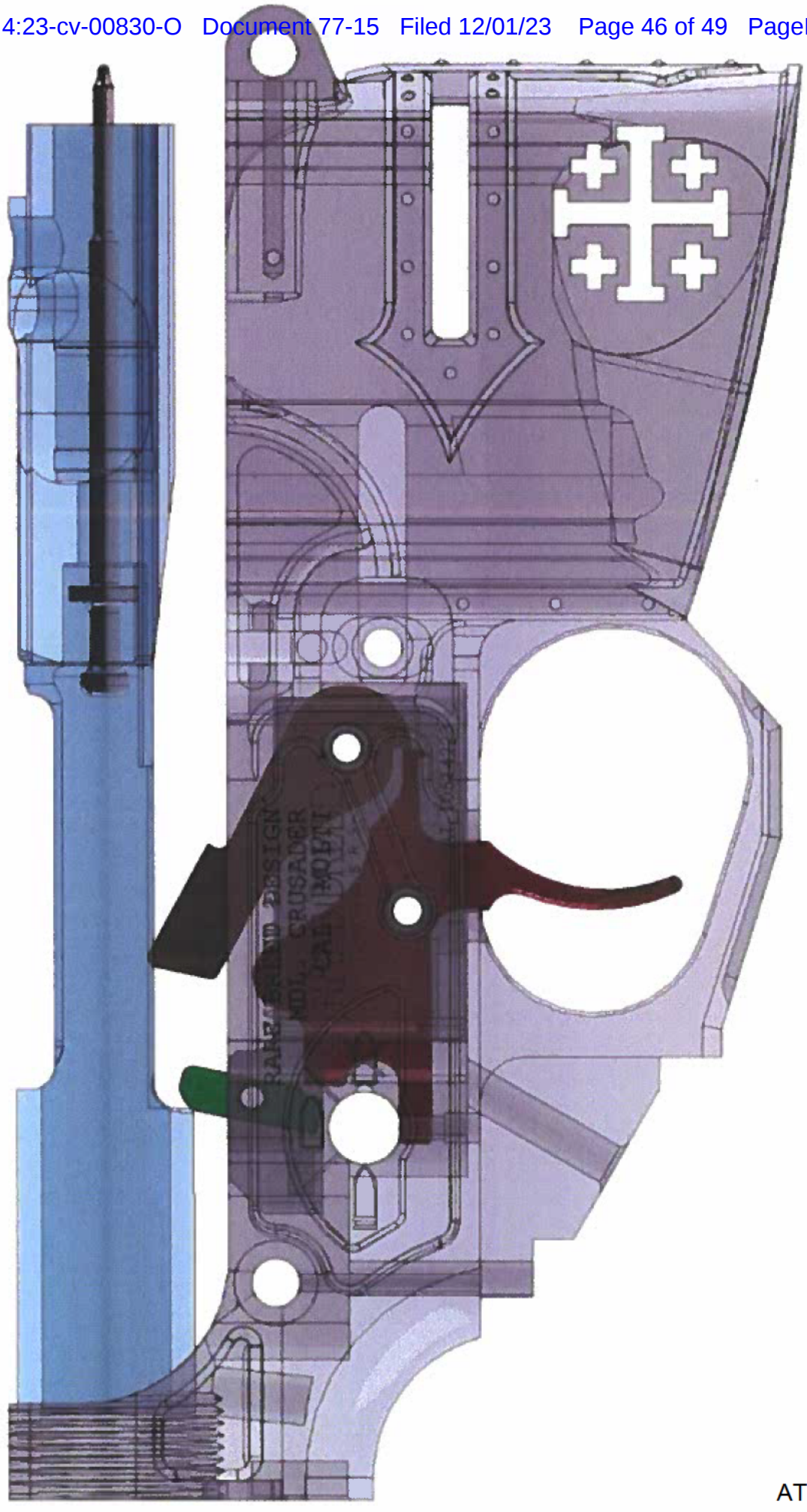
6 - Exhibit 1 - Picture 8

2021-595-I



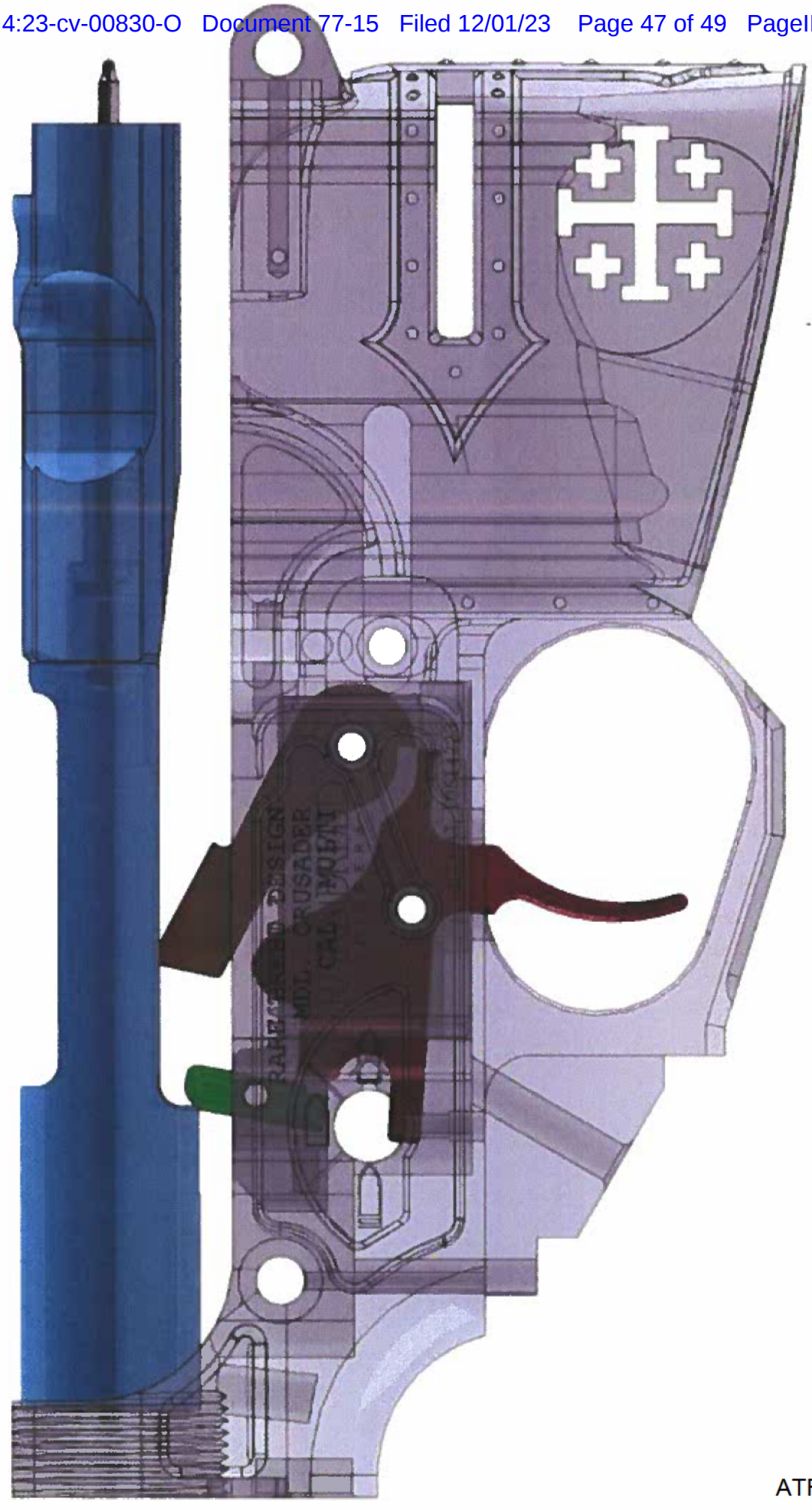
6 - Exhibit 1 - Picture 9

2021-595-



6 - Exhibit 1 – Picture 10

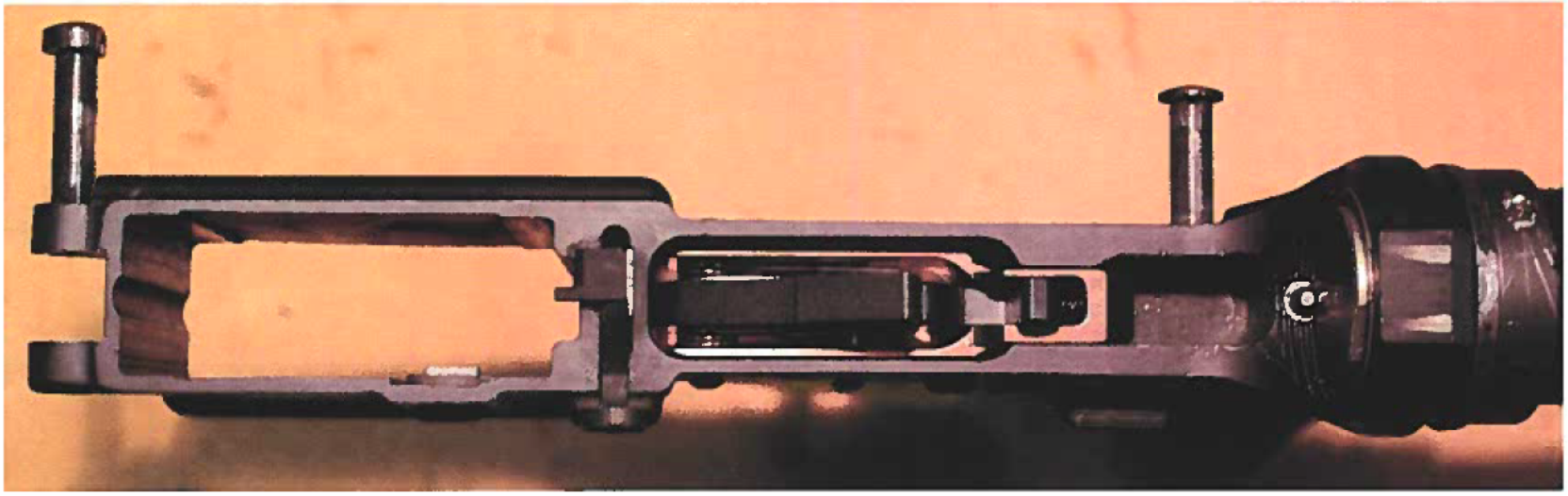
2021-595-I



6 - Exhibit 1 - Picture 11

6 - Exhibit 1 - Picture 12, 13

2021-595-I



ATF 0954

2021-595-I

6 - Exhibit 1 – Picture 14, 15